SAFE DISPOSAL AND MANAGEMENT OF UNUSED, UNWANTED CONTRACEPTIVES

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INTRODUCTION

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In partnership with governments and other agencies, UNFPA supports sexual and reproductive health services. To ensure commodity security and access to wider options of contraceptives, UNFPA encourages the use of good procurement practices and places emphasis on the quality of the contraceptive products that reach the end users. A key part in the procurement of reproductive health commodities is the management of the product throughout its life cycle. The management of waste from contraceptives or unusable contraceptives needs to be considered to ensure environmentally appropriate methods are used during disposal. For purposes of this guide, the following terms will be defined as follows: contraceptives will include hormonal contraceptive methods, intrauterine devices, male and female condoms. Unusable contraceptives will include contraceptives that cannot be used due to any of the following – expired, poor quality, damaged or unrecognizable.

There are international guidelines that make recommendations for disposal of various types of medical waste. However, contraceptive waste has unique characteristics which require specialized guidelines. Guidelines on the safe disposal of pharmaceuticals have been developed by WHO[1] (http://www.who.int/water_sanitation_health/medicalwaste/unwantpharm.pdf), but there is limited information specific to contraceptive waste disposal and management. Unusable contraceptive waste can consist of, but is not limited to, latex material from condoms, plastic from bodies of IUDs, packaging materials for contraceptives etc., and more importantly, estrogen and progesterone and their derivatives included in hormonal contraceptives. The purpose of this document is to provide guidance and information to institutions e.g., Ministries of Health (MoH) or organizations like NGOs on the safe disposal of unusable contraceptives. It is recognized that local or national guidelines or laws on disposal of contraceptives may be available in countries, therefore this document only provides options for safe disposal and management of contraceptive waste where there is insufficient or no guidance available. This document is not intended to provide information for disposal of used contraceptives or its packaging arising from individual use.

1.1 Purpose of the document

- To provide guidance on the safe disposal of unusable contraceptives;
- To guide countries in developing or updating country-specific waste disposal policies and guidelines that include disposal of contraceptive wastes;
- To build awareness and capacity in managing of contraceptive waste.

1.2 Format of the guideline

The first part of this guideline provides general information and background on the disposal of contraceptives. This information is complemented by three **sections** that provide specific information on waste disposal in the below product categories:

- Hormonal contraceptives.
- Condoms – male and female.
- Copper IUDs

1.3 Rationale and scope

The modern contraceptive methods that fall within the scope of the guidance provided in this document are male and female condoms, oral pills, emergency contraceptive pills, injectable contraceptives, copper intra-uterine devices (IUD), implants, vaginal rings, and other barrier methods e.g., diaphragm. This guideline does not cover disposal of surgical or medical waste that has been in contact with patients.

Hormonal contraceptives include all types of pills, injectables, implants, patches, hormonal rings, etc. These include estrogen and or progesterone. There are IUDs that contain hormones, though their use in developing countries is limited. If hormonal contraceptive waste is not disposed of in a proper manner there are risks of environmental pollution.

It is well established that environmental estrogen has an effect on aquatic life[2] but it is not confirmed whether it has similar effect on humans[3]. There is evidence of adverse effects of environmental estrogen in populations with relatively high exposures, but there is not enough research to provide a definitive link. The effect of natural estrogen on humans also needs to be researched and documented. It is difficult to estimate the quantity of estrogen released from disposal of hormonal contraceptives as opposed to natural and synthetic estrogen. Nonetheless, it is imperative to dispose unusable hormonal contraceptives with minimum effect to the environment.

With regard to condoms, most male condoms and some female condoms are made of rubber latex material which is biodegradable except when it remains under water. Some condoms are also made of polyurethane which will not biodegrade at all.

In addition to the active ingredients of hormonal contraceptives and compounds used for manufacturing male and female condoms, and IUDs, there are other types of waste arising from contraceptive commodities – such as primary and secondary coverings or packaging. Recycling of these materials should be encouraged, but this may not be possible in all countries.

1.4 Reasons for Disposal

The following are the most common reasons that make contraceptives unusable.

- **Expired** – items, whose expiry dates have been exceeded or items that have expired during the time they have been transported or stored in the supply chain network before distribution.

- **Damaged** – items that have been damaged during transport and/or storage. The delivery stage of the procurement cycle is one of the more difficult stages to manage and, even with a quality assurance system for procurement, problems can occur and contraceptives can be exposed to a damaging environment or to poor handling procedures.[18, 4, 5] This can include sterile items where packaging has been damaged, items with leaking containers, and cold chain items that have not been transported or stored within the right temperature range. Where there is evidence of particularly poor environmental storage then review of product integrity and sterility may be required. Preservation of products throughout the supply chain, from the storage conditions to delivery to the agreed destination, is the responsibility of all parties and resolution of disposal of affected products should involve the manufacturer.

- **Items not meeting quality standards** – items that do not meet quality standards are likely to have problems that may be discovered after delivery in a number of ways:

  1. The products may be tested on receipt and found not to comply with the specifications – although good procurement practice is always to arrange this before dispatch from the manufacturer.
  2. The factory may discover a problem with the product after it has been shipped (if this ever occurs it is likely to be due to unnoticed drift in process control parameters as all raw materials, intermediate and final product are fully tested before proceeding through manufacturing and final release).
  3. If a delivery has been split between two recipient organizations, one may discover a problem.
  4. Complaints received from users.

Unidentifiable items – Especially pharmaceutical items that have incomplete or missing labels or labels that cannot be understood or recognised.

- **Recalled items** – items that are recalled by the regulatory agency, supplier, or manufacturer.

1.5 What to consider before disposing of contraceptives

Commodities are valuable; in terms of cost of raw materials and hours of labour needed for the commodities' manufacture, procurement and distribution. Disposal of contraceptives will inevitably involve waste of these materials and environmental pollution at the same time. Therefore, commodities removed from the distribution chain need to be replaced to avoid a stock-out. If the contraceptives are not available to the users in time, unwanted pregnancies and sexually transmitted infectious diseases can occur. For these reasons, it is necessary to explore all possible means to minimize the need for disposal.

Minimizing the need for disposal

The need for disposal can be minimized by considering the following steps at the right time and by effective communication among involved agencies.

Planning aspects

- Before ordering, consider carefully the specifications, design and labeling options, and obtain as much information as possible to ensure the choices are suitable for the local users.
- Maintain control over donations. Donations should only be accepted when they are suitable for the programme concerned, and there is assurance on product quality, packaging and remaining shelf life.
- The time that the shipment sits in port should be as short as possible. All documentation should be prepared in advance of the arrival of the shipment, where required, contact should be made with the regulatory agency and the relevant customs officials to get the products cleared and delivered to the warehouse in the shortest time possible. This is to ensure that appropriate storage and handling conditions are observed in order to minimize any damage of the products.
- Planning and stocking of only the required quantities of contraceptives.
- Regular (monthly) review of demand and the quantities delivered and distributed.
- Tracking of residual shelf life of products in warehouses; this includes identifying stock which has not moved out of warehouses for over a period of one year as well as stock which have less than one year of shelf life.
- Ensure that storage conditions are appropriate for the products.
    - In the case of condoms, the average temperature should be kept below (30^{+5}_{-2})°C, although higher temperatures for short periods can be tolerated. Temperatures below 0°C should be avoided. The cartons should be off the floor and away from walls, protected from moisture, and distributed using a First Expiry, First Out (FEFO) basis. Communication with other locations involved in similar programs is important so that such nonmoving and slow moving stock could be redistributed to locations where the products may be in demand.
    - Hormonal contraceptives need to be stored in accordance with the storage conditions indicated by the manufacturer.
- Ensure good coordination by the MoH in order to avoid overstocking.

Quality aspects

- Ensuring the specifications are correctly defined and reviewed as part of demand and supply management.
- Purchase only from quality assured sources, for example male and female condoms and Copper IUDs prequalified by the WHO/UNFPA Prequalification Scheme and hormonal contraceptives that are prequalified by WHO. These factories would have undergone a thorough inspection and product testing according to international standards thereby minimizing risk caused by poor quality.
- Setting up and monitoring transport and storage conditions to avoid damage to products during these processes at all levels of the supply chain.
- Where testing is done at recipient locations, the capabilities of laboratories testing the products at various stages of supply chain are to be established and confirmed with required accreditations such as the most current version of ISO 17025 (general requirements for the competence of testing and calibration laboratories) and participation in inter-laboratory proficiency trials.

Logistics information management aspect

- Ensuring availability of stock and information on what is in the pipeline for delivery to the country.
- Supporting and promoting the implementation of programme management aspects such that the materials are used appropriately and need for disposal is minimized.
- Sharing issues and lessons learned on handling, transportation and stocks management.
- Regularly recording the stock on hand, waste and adjustment.
- Giving feedback on reports received from the lower levels.
- Ensuring that required storage conditions are maintained in the warehouses, so that the stocks do not get damaged due to poor storage conditions.

Alternatives to destructive disposal

Destroying any manufactured item constitutes a waste of raw materials and energy, as well as a considerable expense.

- If the specifications of the products received are not appropriate for use in one programme or location, it should be explored whether the specifications could fit with the requirements for any other programme or location.
- If the reason for rejection is of a packaging nature, the products could be repacked, followed by a quality assurance verification that this has been carried out satisfactorily and the products meet the required specifications. This is especially applicable if there are labelling deviations or damage to exterior packaging due to storage where only a few component units are involved.
- Where possible, the rejected products could be sent back to suppliers taking into consideration the additional costs and regulatory requirements.

If any of these options are to be implemented, prompt action is essential. Making the necessary arrangements can take longer than expected, and delays detract from the remaining shelf-life of the product.

Ensuring that contraceptives which are disposed of are not fit for use

- Review against specifications required for the programme. If the decision to destroy a shipment of contraceptives is based on a laboratory test, the test results should be carefully reviewed, and if appropriate, a further independent test by a third party ISO 17025 certified laboratory should be commissioned. Independent experts can also be asked to comment on the results. Laboratories used by UNFPA are highly experienced and accredited. The products will also have been tested by the manufacturer before release. Therefore any subsequent negative laboratory result should be reviewed in the light of the other tests already completed.
- Where disposal is warranted because of damage to external packing, it should be ensured that only the external packing is damaged and that the products are not affected in any way by this damage. If the product is not affected it should be used.

Where the product is found not to be in accordance with specifications on minor parameters (e.g., non-critical labelling, minor size variations, minor lubricant variations), it may be possible to accept a shipment on a concessional basis.

Minimizing the cost

- Early actions in identifying the need for disposal or potential need for disposal.
- Immediate alert for preventing further supplies of such products.
- Selecting the technically effective and cost-effective methods for disposal, and balancing the local cost implications of labour versus simple automated destruction equipment/ steps involved, where applicable.

Maintaining continuity of supply to users

When contraceptives are rejected after delivery and withdrawn from the supply chain, it may cause a shortage of supply, since replacement stocks are not always immediately available. Therefore, some strategies below may be used for mitigating this:

- Estimation of quantities involved in supply and distribution pipeline.
- Redistribution of quantities of alternate products available in other locations, e.g., if only a few batches of particular products are involved.
- If the rejections are due to manufacturing issues involving a large number of batches, immediately procuring products from alternate suppliers and undertaking appropriate actions for reimbursement of funds may be required.
- Arranging for new supplies to be shipped by air, with the resulting cost implications taken into account.

Safety and security; ensuring that contraceptives which give inadequate protection, or may be harmful, are not inadvertently distributed

- Once a doubt has been raised about a particular Lot[i] of contraceptives, they should be quarantined from other Lots. This may be done by physically separating them from the others (e.g., by moving them to a different place, or by delineating them using ropes, chains, etc.) or by clearly labelling each carton or pallet. Stock records should be annotated accordingly.
- If the affected Lot is already being distributed, a decision about trying to recall it will need to be made, depending on the seriousness of the situation, and the logistical feasibility of achieving a recall. Recalls may be limited to the distribution chain, but may need to extend to consumer level if there are very serious safety and efficacy issues with the contraceptives.
- A Lot earmarked for disposal needs to be stored securely until this is able to occur. A Lot that has been retested or re-evaluated, and found to be acceptable should be restored to the normal storage situation.

Until disposal takes place, appropriate steps should be taken to prevent accidental or intentional distribution. The level of precautions will depend on the context and conditions of the country concerned, and in some cases it will be sufficient to label the cartons as rejected. In countries where the threat of recovery and redistribution is high, it may be necessary to maintain some level of supervision from the time they leave the warehouse until they are actually rendered unusable.

Minimizing environmental impact

- Through selection of appropriate methods for destruction/ disposal of products identified.
- Through early actions to contain further supplies of such products which will ultimately be identified for destruction.
- While drafting product specifications for procurement, consideration to be given to avoid usage of materials which would pose environmental issues e.g., avoiding use of PVC packaging materials

1.6 Steps or Administrative Procedure for contraceptive waste disposal

Contraceptive waste disposal procedure is different from commonly generated medical waste but quite similar to disposal of expired medicines or medical supplies. Disposal of unusable contraceptives will follow the administrative procedures of the country concerned. However, to ensure contraceptive security, the following general disposal stepsare to be considered:

[i] The word "Lot" is capitalized to emphasize that it is the technical term for batch of condoms/contraceptives and to distinguish it from " a lot" meaning "many".

DECISION

The identified contraceptives are not suitable for use

APPROVAL

In the countries, depending on the administrative level, there is need of **approval** for disposal from the higher authority. Sometimes it may be more than one authority and beyond ministry of health. This authority will differ from country to country and may be the department responsible for pharmaceutical management within the ministry of health, the drug regulatory authority, or the regional or local health authorities. In some countries, the ministry of the environment should be involved.

PLANNING

After identifying process of disposal **planning**, in terms of identifying the necessary expertise, human resources, time line, physical space, equipment, tools, and required funding, is necessary. This is essential before starting disposal activities. Disposal options vary considerably according to type of wastes and situations.

SECURITY

In many countries, health commodities require security and control. In some countries, scavenging of material from landfills is a frequent problem, and, scavengers sell disposed drugs and commodities back to market. For this reason, ensuring **security** is necessary so that un-usable commodities do not get back to the market.

DISPOSAL METHODS

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In 1999, WHO, in collaboration with partners, engaged with procurement and drug safety authorities to develop guidelines for the safe disposal of unwanted pharmaceuticals in and after emergencies[6] (http://www.who.int/water_sanitation_health/medicalwaste/unwantpharm.pdf). The disposal methods discussed in this section are applicable for contraceptives and taken from that guideline.

2.1 Landfill

Waste sent to a landfill is placed directly into a land disposal site without prior treatment or preparation. Landfills are the oldest and the most widely practiced method of disposing of solid waste. There are three types recognized.

- **Open uncontrolled non-engineered dump:** A non-engineered dump is probably the most common land disposal method in developing countries. However, untreated waste discharged into an uncontrolled, non-engineered open dump does not protect the local environment and should not be used. It should be noted that discarding waste in open, uncontrolled dumps with insufficient isolation from aquifers or other watercourses can lead to pollution, with the risk of contamination to drinking water in the worst cases.

- **Engineered landfill:** Direct deposit of pharmaceuticals is the second best option to discharge immobilized pharmaceutical waste into a landfill. This type of landfill has some features to prevent the loss of chemicals into the aquifer.

- **Highly engineered sanitary landfill:** Properly constructed and operated landfill sites offer a relatively safe disposal route for contraceptives and many other waste pharmaceuticals. The top priority is protection of the aquifer. An appropriate landfill consists of an evacuated pit isolated from watercourses and above the water table. Each day's solid waste is compacted and covered with soil to maintain sanitary conditions. The term "safe sanitary landfill" refers to such a site that is adequately situated, constructed and managed.

2.2 Waste immobilization

Encapsulation

Encapsulation involves immobilizing the products (hormonal contraceptives in this case) in a solid block within a plastic or steel drum. Drums should be cleaned prior to use and should not have previously contained hazardous materials. They are filled to 75% capacity with solid and semi-solid contraceptives, and the remaining space is filled by pouring in a medium such as cement or cement/lime mixture, plastic foam or bituminous sand. For ease and speed of filling, the drum lids should be cut open and bent back. Care should be taken to avoid cuts to hands when placing contraceptives in the drums. Once the drums are filled to 75% capacity, the mixture of lime, cement and water in the proportions 15:15:5 (by weight) is added and the drum filled to capacity. A larger quantity of water may be required sometimes to attain a satisfactory liquid consistency. Steel drum lids should then be bent back and sealed, ideally by welding. The sealed drums should be placed at the base of a landfill and covered with fresh municipal solid waste.

Inertization

Inertization is a variant of encapsulation and involves removing the packaging materials, paper, cardboard and plastic, from the pharmaceuticals. For example, pills would need to be removed from their blister packs. These are then ground and a mix of water, cement and lime added to form a homogenous paste. Worker protection in the form of protective clothing, gloves, protecting boots and masks is required as there may be a dust hazard. The paste is then transported in the liquid state by concrete mixer truck to a landfill and decanted into the normal urban waste. The paste then sets as a solid mass dispersed within the municipal solid waste. The process is relatively inexpensive and can be carried out with unsophisticated equipment. The main requirements are a grinder or road roller to crush the pharmaceuticals, a concrete mixer, and supplies of cement, lime and water. The approximate ratios by weight used are pharmaceutical (contraceptive) waste 65%, lime 15%, cement 15% and water 5% or more to form a proper liquid consistency.

2.3 Incineration

There are two types of incineration: medium temperature incineration (750 – 900°C) and high temperature incineration (1100-1400°C).

- **High temperature incineration:** Clinical waste should be burned in an incinerator at a temperature between 1100-1400°C with filters to remove the particles as well as toxic gasses (e.g., Gas Turbine and Dust Filtration). For some gasses, the temperature required will be 2000°C (WHO 1999). The remaining slag or ash in the incinerators can either be used as material for new roads or if too polluted with heavy metals it would have to be transported to a landfill coated with a plastic membrane or clay, etc. to prevent soil and groundwater contamination under the landfill.

- **Medium temperature incineration:** In many countries there are no high temperature-chambered incinerators designed to handle more than 1% halogenated compounds. Such incinerators meet strict emission control standards. However, it is likely that in most countries medium temperature furnaces and incinerators are available. In emergency situations the responsible authorities may consider it acceptable to treat expired solid from pharmaceuticals using a two-chamber incinerator that operates at the minimum temperature of 850°C, with a combustion retention time of at least two seconds in the second chamber. The incinerator should be pre-heated to about 600°C before the commodity is introduced.

Industries which use high temperature technology, such as cement kilns, coal fired thermal power stations or foundries usually have furnaces that operate at temperatures well in excess of 850°C, have long combustion retention times and disperse exhaust gases via tall chimneys, often to high altitudes. Many countries do not possess and cannot justify expensive and sophisticated chemical waste disposal facilities, so the use of an industrial plant provides a viable and cheap alternative. Cement kilns are particularly suited for the disposal of expired pharmaceutical products, chemical waste, and used oil, among others.

If possible, an emission control system must be enclosed within the incineration process to assure emission limits established by law. Particularly important is a flue gas cleaner system that will guarantees gas emission that is free of significant amounts of particulate matter, heavy metals, and dioxins.

2.4 Chemical decomposition

The method involves removal of the formulation such as tablets from their pack or opening and emptying liquid injectables into bulk containers before chemical decomposition. Because of the hazards posed by this method to the operators who may be involved in these operations, it is necessary that these operations are carried out under controlled conditions (Bio/chemical safety cabinets) to avoid exposure of the personnel and environment to potent hormones. However, this involves the use of a specialized facility and is expensive. If this method is chosen, the type of chemical reaction to be carried out and agents to be used would be decided based on the advice from the manufacturers. Due to cost and need for specialized facilities, this still remains to be the least preferred option for disposal of contraceptives outside the manufacturer's premises.

2.5 Return to donors or manufacturers for disposal:

Wherever practical the possibility of returning unusable contraceptives or drugs for safe disposal by the manufacturer should be explored; particularly drugs which present disposal problems. For unwanted, unrequested donations, especially those that arrive past or unreasonably near their expiry date it may be possible to return them to the donor. It is important to note that when drugs are returned to donors, their disposal must be in accordance with the Basel Convention. This convention was developed to address the uncontrolled movement and dumping of hazardous waste, including illegal dumping in developing countries by companies or organizations in developed countries.

The Basel Convention considers the exportation of expired drug products as 'illegal traffic'. Signatories to the convention are required to take the waste back or arrange for disposal of the waste. Expired or spoiled drug products are considered hazardous waste and if they are transported across frontiers, they become regulated and subject to The Basel Convention on the Trans Frontier Shipment of Hazardous Wastes. This involves obtaining permission, which can take several months, to cross international borders before transportation can take place.

Packaging Materials and other related waste

Secondary and tertiary packing materials are recyclable. However, primary packaging materials such as foil laminates, ampoules, prefilled syringes, etc., which are not recyclable, must be disposed of in the same form as the hormonal contraceptives. Landfill or incineration are possible options for disposal.

SAFE DISPOSAL AND WASTE MANAGEMENT OF HORMONAL CONTRACEPTIVES

3

3.1 Background

The disposal of hormonal waste should be strictly conducted according to international and national legislation, and in accordance with the requirements of relevant national and local authorities. The guidelines can be used by all relevant health authorities competent to authorize the use or disposal of medicines and pharmaceutical products. In many countries such disposal will also involve environmental and waste management authorities, and experts at ministerial, regional and local levels. Depending on the situation in the country, the appropriate authority may be a department responsible for pharmaceutical and drug management within the ministry of health, the drug regulatory authority (if different from the former), a regional or local health authority (pharmaceutical officer) or the ministry of environment, etc. It is the responsibility of the qualified appropriate authority to implement the guidelines in coordination with regional and local health authorities, as well as with the directors of health facilities that face the problems of drug disposal. The different hormonal contraceptives are described below:

- **Oral Pills, Emergency Contraceptive Pills, Contraceptive Patch, Combined Vaginal Ring, Hormonal IUD:** There are several types of oral contraceptive pills composed of estrogen or progesterone or both. Emergency contraceptive pills may also contain a combination of estrogen and progesterone or progesterone alone. The most common form of estrogen used in oral pills is ethinylestradiol and for progesterone the common presentation include levonorgestrel, norgestrel, norethindrone.

- **Contraceptive Patch** is a small, thin flexible plastic which is square in shape and worn on the body. The active ingredient of the patch is estrogen and progesterone[7]. The patch has to remain on the body surface for three weeks and then is removed for the fourth week.

- **Combined Vaginal Ring** is composed of a polymer called polyethylene vinyl acetate. The hormones used are ethinyl estradiol (which is the estrogen component) and etonorgestrel (the progesterone component).

- **Hormonal IUD**, though use rate is very low in comparison to the copper IUD, hormonal IUD contains a reservoir of the progesterone levonorgestrel in the stem of a T-shaped plastic device.

- **Contraceptive Injectables** Depomedroxy-progesterone and norethisterone, derivatives of progesterone, are commonly used in injectable contraceptives. Injectable contraceptives are available in vials and ampoules.

- **Contraceptive Implants:** Implants are small rods made of silastic materials that are placed under the skin of the forearm. Depending upon the brand, implants could be one or two rods. Silastic is an inert substance and not bio-degradable. Implants contain progesterone hormone like levonorgestrel and etonorgestrel.

According to a recent study, the emission of ethinyl estradiol from landfills is negligible. If sands are present below landfills, it can act as a strong absorbent and further reduce the chance of ground water contamination.[8]

For further information on safe disposal of unwanted pharmaceuticals in and after emergencies refer to WHO Guidelines, 1999.[9]

3.2 Ways of disposing of hormonal contraceptives

In Section 2, the different types of disposal methods were described; however, depending on the specific hormonal contraceptive and the resources available at that time one method is likely to be preferred over another one, as will be discussed below.

Hormonal contraceptive tables are packed in primary packing of aluminum foil and aluminum foil/PVC blisters. They are subsequently packed in pouches and secondary cartons made of paper board, which are further packed in shipping cartons made of kraft paper.

In comparison, the hormonal patch and hormonal rings are packed in primary packing of aluminum and polymer sealant layer laminates, followed by a secondary packing of paper board boxes and tertiary packing of shipper cartons of kraft paper.

The first step involved in the disposal of the hormonal patch and ring is removing them from their shipper cartons and secondary cartons. The ampoule trays are disposed of separately by incineration or landfill.

The hormonal contraceptive tablets are taken up for disposal by inertization and land fill. If tablets are packed in blisters containing PVC, they should not be incinerated. However tablets packed in aluminum foils can be incinerated. Injectables are also disposed of by inertization and land fill. In rare cases they can be disposed of by chemical inactivation, but this is less preferred due to risks of exposure to potent hormones by workers and the environment.

Hormonal injectables are packed in a primary pack of ampoules or prefilled syringes. They are further packed in secondary packing of sleeves of plastic/paper board trays and cartons. They are shipped in shipper cartons made of kraft paper.

3.3 Selecting the options

Waste management options for Hormonal Contraceptives	
Oral Pills (with primary covering)	
Estrogen and Progesterone	• Landfill • Incineration (Other than PVC blisters) • Encapsulation • Inertization (Only the pills after separating them from the blisters. Blister materials can be incinerated if it is of aluminum or placed in a landfill)
Hormonal Patch (with primary covering)	
Estrogen and Progesterone	• Landfill • Incineration
Hormonal Ring (with primary covering)	
Estrogen and progesterone	• Incineration
Hormonal IUD (with primary covering)	
Progesterone	• Incineration
Implants (with primary covering)	
Progesterone hormone in silastic rods	• Incineration
Injectable contraceptive (with primary covering)	
Progesterone Glass vials/ampoules	• Landfill • Crush the vials/ampoules and then dispose through landfill

SAFE DISPOSAL AND WASTE MANAGEMENT OF MALE AND FEMALE CONDOMS

4

4.1 Background

Male latex condoms and female condoms are purchased by governments, international organizations, non-governmental organizations (NGOs), social marketing organizations and donors, and are distributed as part of campaigns to prevent sexually transmitted infections and unwanted pregnancy. Male latex condom production worldwide is estimated at more than 10 billion a year and many of these condoms are sold in the highly regulated markets of developed countries. In comparison, female condoms are fairly new to the market and are produced at a much lower volume, e.g. about 35 million a year. They are marketed predominantly in developing countries, by public agencies and NGOs.

WHO guidelines for public sector procurement of male latex condoms[10] and female condoms recommend procurement of these products only from manufacturers who have undergone and successfully completed the World Health Organization/United Nations Population Fund (WHO/UNFPA) Prequalification Scheme. This Scheme follows international standards and WHO/UNFPA specifications and guidelines to ensure that products meet quality, safety, and efficacy requirements. Furthermore, independent Lot by Lot pre-shipment testing for all UNFPA orders minimizes the risk of acceptance of poor quality products. However, despite these rigorous quality processes, there may occasionally be times when bulk quantities of these products will need to be safely disposed of at the country level.

In some cases, where condoms are purchased in large numbers, occasional testing on receipt, or surveillance testing in the distribution chain may suggest that the condoms are unfit for distribution, or the condoms may have reached or exceeded their expiration date before distribution. Often there are no established procedures for dealing with a quantity of condoms which are unacceptable for distribution.

For condoms and IUDs acquired using the UNFPA purchasing scheme, both the manufacturer and an independent testing lab will have checked the quality of each Lot and accepted it before it was shipped. Further information on this can be acquired by contacting UNFPA's Procurement Services Branch (QA@unfpa.dk).

In the case of condoms, the requirements ensuring they are free from holes and inflation are quite stringent, and lots with a small proportion of non-complying condoms are rejected. Sometimes, pure chance may result in a bad test result, even though the product itself conforms to the requirements. This is a possible outcome with all tests where the result is based on inference from small samples. Extensive information related to freedom from holes and inflation tests can be found in the WHO/UNFPA Male Latex Condom Specification.

4.2 Ways of disposing of condoms

Condoms for public projects are generally supplied in cartons and gross boxes. Male condoms are supplied in individual foil containers and female condoms may be supplied in plastic or foil containers. Therefore, the product may have the following components:

- Cardboard in the cartons and inner boxes
- Plastics in the foil wrapper
- Aluminum in the foil wrapper
- Lubricant (usually silicone fluid)
- Powder on the condom
- Natural rubber
- Nitrile or other synthetic rubbers
- Polyurethane
- Small quantities of rubber processing chemicals
- Various plastics from female condom retention features

New products, especially female condoms, are likely to enter the market on an unpredictable schedule from many different suppliers. It is impossible to predict what materials will be used, but it is likely that a silicone rubber or polyethylene product will be marketed.

All product components except the cardboard are mingled together intimately, and therefore separation of the components is extremely difficult. There is currently no available process for doing so. The plastics

in a male condom pack are bonded to the aluminum and are contaminated by the silicone fluid as is the rubber.

Each packed male condom weighs about 3 g, and a male condom Lot usually consists of 500,000 such packets. Female condom packs can weigh from 5 to 12 g each, and the Lot size can be from 10,000 up to several hundred thousand. As with male condoms, where the inner boxes have been coated with a plastic, it is difficult to separate the layers in them, and such inner boxes will probably not be suitable for paper recycling.

Although the individual components are separately recyclable, separation can only be done by hand, and is not practical at present. **Burial** and **incineration** appear to be the only methods available for disposing of large quantities of condoms. The only exceptions may be the cartons and inner boxes. Cardboard cartons can be re-used or re-cycled in the same way as for other cardboard containers.

General Landfill

As discussed previously, a landfill is the most common form of waste disposal in most countries. Waste is collected and taken to a designated site, where it is tipped, and from time to time, covered with a layer of soil. Typically, large depressions in the ground are filled. Eventually, the site will be closed for further disposal, and in some circumstances, it may later be developed for industrial or residential uses.

Such sites generally accept rubbish in return for payment on a volumetric basis. In many developing countries some "scavenging", in which items of value are recovered, takes place. Therefore, it is quite possible that dumped unused condoms could be found, and that they may end up being sold.

If there is a significant risk of scavenging, then shredding or compacting (in a compacting garbage truck or stationary compactor) of the condoms may do sufficient damage to make them unsuitable for reuse. Until the condoms have been rendered unattractive to use, their disposal should be kept in supervised storage. It may also be possible to arrange for condoms dumped in landfill to be covered immediately with other rubbish, to an agreed depth, in order to minimize the risk of scavenging.

Specific burial

Decay may be aerobic (i.e. exposed to air) or anaerobic. As far as condom disposal in a landfill is concerned, it is prudent to ensure that they are buried immediately after dumping, and thus the dominant decay processes will probably be anaerobic.

The consequences of burial are similar to those of burying domestic waste. The outer layer of a male condom pack may be cellophane, polyethylene or a similar plastic, while the inner layer will be polyethylene or a similar material, and there will be aluminum in between. These materials are widely found in packaging and in landfills.

When it is buried, the average total time for complete bio-degradation of cellulose film is two to three months for uncoated products, and three to four months for coated cellulose products. In lake water, the rate of bio-degradation is about double the above. The decay time is increased by heavy metal pollution and decreased by presence of manure.[11] Polyethylene is known to take a very long time to degrade in the environment.

The anaerobic degradation of the plastic and rubber will ultimately result in carbon dioxide and methane (in roughly equal quantities) as the end products. These are major greenhouse gas contributors, and methane is about 30 times as dangerous as the same amount of carbon dioxide. Therefore, it is better practice to burn methane into water and carbon dioxide than to release it into the atmosphere. The decay mechanisms of normal and modified polyethylene are discussed in the following section under "incineration".

The aluminum layer will probably be attacked by the acidic soils in the landfills. It will react to form hydrogen gas and solid compounds in the presence of both dilute acids and alkalis. The silicone fluid will probably leach into the landfill. Degradation is catalyzed by some ingredients in the soil, but the speed of the process depends on whether the soil is moist or not, and on the type of clay present. In very dry soil, the de-polymerization reaction can be

quite rapid (days)[12], but in wet soil will take much longer. Further degradation to carbon dioxide and inorganic silicates will follow.[13, 14]

Rubber can be degraded by a number of bacteria, enzymes, and fungi which are present to different extents depending on the landfill site. Male condoms can disintegrate to particles within a few months when buried in soils containing appropriate nutrients while rubber is more readily decomposed by exposure to sunlight and oxygen. Female condoms and their retention features may be made of a variety of materials (including rubber) and it is thus difficult to generalize on their degradation.

In view of the risks of using general landfill in some countries, it may be safer to find a suitable site to bury unusable condoms. This would require the cooperation of the landowner. In this scenario, a hole would be dug and the condoms dumped in it, and the hole would then be refilled with at least 1 meter of soil on top of the condoms. Preferably, the operation would be conducted in a remote location, where it is likely to negatively impact people living in the area. It is also important to consider the land required for this type of disposal. One Lot of 500,000 male condoms can occupy a volume of about 20 cubic meters, and would require a hole about 2 m deep, 3 m wide, and about 4 m long. There would be considerable soil left over, which would need to be used or disposed of.

Such an operation needs detailed planning in order to be successful, and the burial should be supervised in most situations.

Shredding and compaction

If condoms are to be buried, shredding should be considered for two reasons:

1. To prevent their sale or use if they were later found or dug up
2. To facilitate biodegradation.

If a normal landfill is being used to dispose of condoms, it is possible that they may be seen for some time before being covered by other rubbish or earth.

As explained above, a typical condom foil will have an outside layer made of polyethylene, which can take about a year to begin significant decay, with an intermediate layer of aluminum foil. The aluminum foil will take several years to decay, unless it is accelerated chemically. The condom inside, coated in silicone fluid, is protected from outside influence until the package fails. Thus, if rapid decay is desired, the condoms should be shredded.

On the other hand, the condom itself is a rather difficult product to shred. The aluminum foil is within the capability of many industrial shredding machines, but the contents, a highly lubricated, very thin, highly extensible piece of rubber is likely to be very difficult to cut. Document shredders (which are the most common) are not designed for cutting condoms and should not be used for this purpose.

Nonetheless, simply damaging the packs may be sufficient to deter people from re-using the condoms, and to speed up decay. Where the quantities are under about 3000 condoms, it is also possible to open each individual pack, to discourage use.

If a suitable shredding plant is available in the area where the condoms are to be destroyed, then a sample should be taken to the plant, and the operators asked to do a test run. If the packs are sufficiently damaged by the process, and the shredding machine does not jam or clog up, then the shredding operation should be possible. The most likely outcome will be that the packets are cut, and that at least some of the condoms will be undamaged.

Industrial shredders may be in use for the destruction of foods, pharmaceuticals, rubber, pallets, steel and plastic drums, furniture, construction debris, tyres, containers, corrugated boxes, packaging, labels, and other bulky materials. In some areas, they may be in use in municipal recycling centers. Scrap wood is shredded and used for the manufacture of products such as particle board and paper. Plastic bottles are recycled into plastic chips for the production of new bottles. The more powerful industrial shredders will handle large quantities of condoms relatively easily, but the rubber itself may not be cut, and the lubricant will get into the shredder.

Compaction, as carried out by a compacting rubbish truck, can disfigure the packs, provided that the pressure is sufficient to crush the condom packs. It may be a useful technique for condoms which are to be buried, in order to minimize the volume and the risk of their being used. The outcome of compaction is variable, depending on the pressure used, and the other materials that are in the compactor at the time. No research has been conducted on this process for condoms.

Some large organizations which produce a lot of rubbish have stationary rubbish compactors, used simply to reduce the volume of material to be carted away. These may also serve the purpose of disfiguring the packs, and it should be relatively easy to conduct a trial on such units, if one were available for use. Only high pressure units driven by hydraulic presses are likely to be sufficiently strong.

Shredded rubber pieces could also be disposed of by giving to authorized scrap dealers who could recycle the rubber for making other rubber products such door mats and industrial rubber components of low value.

Incineration

The major materials in condoms and their packs are combustible and have a high fuel value. Rubber (latex) and polyethylene are hydrocarbons and silicone fluid contains carbon and hydrogen as well as silicon. Aluminum burns to form inert aluminum oxide. All of the major materials oxidize exothermically releasing nearly as much heat per unit mass as fuel oil or gas. Incineration of packaged condoms can therefore be an energy-efficient means of disposal if the energy of combustion can be recovered. Even if it cannot be recovered, the solid waste volume is reduced to inert ash while carbon dioxide is released to atmosphere.

Clean, complete combustion requires a high temperature, and most high temperature incinerators keep the fuel gas at a high temperature for a given time before cooling and releasing them. The energy released can be captured and converted to useful purposes, in appropriately designed facilities. Depending on the raw materials used, there may also be oxides of nitrogen or sulphur produced in smaller quantities.

As far as is known there are no chlorine compounds present in packaged condoms currently on the market, so the possibility of making harmful dioxins and furans during incineration is currently negligible. Use of different packaging or constituents, such as PVC, would require extra precautions on incineration.

Incineration of condoms oxidizes, or partially oxidizes, the product. There are some possible variants on incineration, as follows:

1. Incineration in a high temperature rubbish incinerator
2. Incineration in a cement kiln or similar device
3. Incineration in a lower temperature incinerator.

High temperature incinerators ensure complete oxidation of almost all the components, including the silicone fluid and the aluminum. A temperature of over 1100°C is generally required.

As the reactions are exothermic, energy is released, and can be used for electricity generation and district heating, etc., if the incinerator has been designed to do so. Such energy recovery incinerators are generally concentrated in developed countries.

Higher temperature industrial heat sources, such as cement kilns, blast furnaces or some brickworks, may be able to accept a limited quantity of combustible waste, which will supply additional energy to the process. It is not possible to generalize about the ability of such plants to introduce combustible wastes, or about their operators' willingness to do so.

High temperature incinerators are also used for destroying hazardous medical waste, and may be available for condom destruction. However, it is likely that such incinerators would have a relatively low capacity.

Low temperature incineration (flames as low as 750°C) will still damage the outer layer of the foil, and melt the heat seal on it, rendering the product effectively useless. The aluminum will melt at about 660°C. Even lower temperatures will disfigure the packages. On the other hand, unless the combustion is complete, there

is a risk that toxic substances could be produced. **This approach is not recommended**. Ad-hoc incineration, i.e. putting an accelerant on the products and lighting them, is most likely to result in incomplete combustion and high air pollution.

The safe disposal of plastics containing chlorine (e.g., PVC) requires special care. The combusted gases need to be held at about 1100°C for about 2 seconds and then quenched. (At present, such plastics are not used in condoms, but they could in the future be found in the retention features of female condoms.)

Consideration must also be given to supervising the shipment from the time it leaves the warehouse to the point at which the condoms are put into the incinerator.

Rubbish collection

This option is possible for small quantities of condoms, generally in developed countries. Where compacting trucks are used, it is probable that the condom packs will be crushed or distorted to some extent and then amalgamated with other refuse, but that depends on what else is in the compacter when the condoms are put in. Without significant compaction, simply putting unusable condoms into municipal rubbish collections is not suitable in low and middle income countries.

4.3 Selecting from the options

* The choice within option 3 will depend on the local circumstances, as will the need for prior treatment of the condoms to minimize the risk of re-use. It may be possible to hire a shredder and compacting truck to crush the products and take them to the landfill. However, the availability of the above options will depend on the country in question. Additional coverage of the condoms with other rubbish or soil will reduce the risk of their being recovered. If condoms are to be buried, shredding should be considered to prevent their sale or use if they were later found or dug up and to facilitate biodegradation.

** Where small quantities are involved, it will most likely be too difficult to implement the most environmentally appropriate solution. Use of a municipal rubbish collection could be considered for, say, less than 20,000, and put into a compacting truck. For intermediate quantities, a rubbish collection firm may be willing to a dedicated truck, compact the contents with a witness present, and take the contents to the landfill. Some organizations have stationary rubbish compactors, which could also be used, provided they operated with a sufficient pressure.

Where disposal of a larger quantity is concerned, the environmental consequences should be considered more carefully, but there will be situations where there are no suitable high temperature incinerators, especially none with energy recovery (e.g., cogeneration) facilities.

INCINERATION

- High temperature incineration with energy recovery
- High temperature incineration with no energy recovery

LAND FILL

- Specific burial *
- General land fill

RUBBISH COLLECTION

- Only if small quantities are involved **

SAFE DISPOSAL AND WASTE MANAGEMENT OF COPPER BEARING IUDS

5

5.1 Background

Copper bearing intra-uterine contraceptive devices (CuIUDs) are a widely used, safe and effective reversible means of long term contraception.[16, 17] In 2007 it was reported that over 16.2 million women ages 15–49 worldwide utilized the device.[18, 19] CuIUD's are comprised of a plastic frame that bears copper as wire or both wire and collars. The two main types are the Copper T 380A (TCu380A) now specified by WHO/UNFPA and supplied by UNFPA and other agencies[20] and the MultiLoad375 (MLCu375). Both products are now supplied by UNFPA and other agencies.[21]

There are also many versions of these copper bearing IUDs with reduced amounts of copper and in different sizes for different user populations although these are less likely to be procured by UNFPA and other agencies.

Copper bearing IUDs are packed in sealed plastic / plastic film or plastic film/synthetic paper pouches and supplied sterile in unit cartons, secondary cartons and transit cases made of cardboard/corrugated cardboard along with printed paper instructions and card inserts.

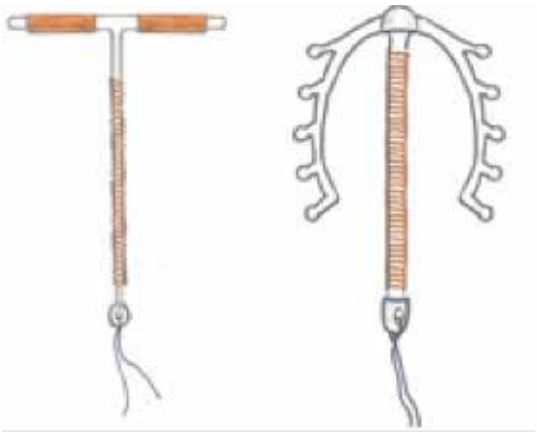

Figure 1 Figure 7.2 Copper-bearing IUCDs (left) TCu-380A, (right) MLCu-375.8.6

WHO guidelines for public sector procurement of copper bearing IUDs recommend procurement of these products only from manufacturers who have undergone and successfully completed the process specified under the WHO/UNFPA Prequalification Scheme.[18] This scheme follows international standards and WHO/UNFPA specifications and guidelines to ensure that products meet quality, safety and efficacy requirements. Copper bearing IUDs are heavily regulated in all market places as Class III long term medical devices and the synthetic plastics, copper and other materials are comprised of rigorously sourced, specified and controlled and the manufacturing, finishing and packaging processes and controls are also similarly fully specified.

The only established issue that causes concern before use in the packaged product is the occasional appearance of tarnishing on the copper, but this in no way affects usability, safety or efficacy of the device and steps have been taken to minimize the incidence of this. In the unlikely event of disputes or rejections, the WHO/UNFPA guidelines provide assistance on resolution.[18]

Benefits of safe, and implications of unsafe, disposal of products and their waste

Developed and developing countries are increasingly aiming for zero waste and to achieve this they are pricing waste disposal to heavily favour recycling and discourage all other forms of disposal – legal and otherwise.[22] The plastics used in contraceptives are effectively medical grade and although not capable of, or permitted for, reuse in medical devices, the plastics are highly reusable in other applications. The copper is the very highest oxygen free grade and very desirable even though the quantities in use worldwide are minimal (2007 figures showed that only approximately 50,000kg of copper was used for the IUDs used by the estimated 162 million women users worldwide).[18] 18 However, disposal of IUD component parts is complicated and rendered problematic where hormone related chemicals are part of the IUD; packaging film, paper and board may be recycled once the plastic is separated from the paper.

5.2 Ways of disposing of IUDs

IUDs have the following components (with variations depending on the exact model – Tcu380A, Cu375):

- Outer carton, i.e. Shipper or Transit
- Inner cartons
- Pouch
- Plastic T with copper and Tie (Suture)
- HDPE Insertion Tube with PVC Flange
- Polypropylene Rod
- Label

All the following components have to be segregated for proper destruction to mitigate the environmental impact.

- Shipper(transport carton),Inner carton, Pouch, Wound T with a Tie/Suture, Insertion Tube, Rod, flange and Label (with variations depending on the exact model – Tcu380A, Cu375).
- All the items mentioned above are to be cut in to small pieces to avoid any complications.
- The cut pieces should be kept in properly labeled bags.
- The cut pieces of plastic items T Frame, flange, Rod, Insertion Tube can be disposed of as scrap because these granular materials can be used in the molding of other plastic items like buckets, etc.
- The cut pieces of pouches, inner cartons and shippers can be buried for the decay by anaerobic means.

General Landfill

Where waste is collected and compacting trucks are used, it is probable that the IUD packs will be crushed or distorted to some extent, but that depends on what else is in the compacter when the IUDs are put in. As with disposal of other contraceptives, the waste is taken to a designated site, where it is tipped, and from time to time, covered with a layer of soil. Typically, large depressions in the ground are filled. Eventually, the site will be closed for further tipping, and in some circumstances, it may be developed for industrial or residential uses. Such sites generally accept waste in return for payment on a volumetric basis. Increasingly, in higher income countries, the costs are escalated to discourage the use of a scarce resource, minimize environmental damage and encourage recycling.

As with the risk of unused condoms entering the market, in developing areas, "scavenging" for dumped IUDs may occur.

Specific Burial

In view of the risks of using general landfill in some countries, it may be safer to find a suitable site to bury unusable IUDs. This would require the cooperation of the landowner. A hole would be dug, the IUDs would be dumped in it, and the hole would be refilled with at least 1 meter of soil[23] on top. Preferably, the operation would be conducted in a remote location, to minimize negative impact on inhabitants in surrounding areas . Such an operation needs detailed planning in order to be successful.

Shredding and compaction

If a normal landfill is being used to dispose of IUDs, it is possible that they may be obvious for some time before being covered by other rubbish or earth. If IUD's are to be buried, shredding could be considered for one of two reasons:

- To prevent their sale or use if they were later found or dug up
- The facilitate biodegradation.

If a suitable shredding plant is available in the area where the IUDs are to be destroyed, then a sample should be taken to the plant, and the operators asked to do a test run. If the packs are sufficiently damaged by the process, and the shredding machine does not jam or clog up, then the shredding operation should be possible.

Incineration

Incineration oxidizes, or partially oxidizes, the product. There are some possible variants on incineration, as follows:

- Incineration in a high temperature rubbish incinerator
- Incineration in a cement kiln or similar device
- Incineration in a lower temperature incinerator.

High temperature incinerators ensure complete oxidation of almost all the components. As the reactions are exothermic, energy is released, and can be used

for electricity generation and district heating, etc. Such energy recovery incinerators are generally concentrated in developed countries. A temperature of over 1100oC is generally required.

Higher temperature industrial heat sources, such as cement kilns, blast furnaces or some brickworks, may be able to accept a limited quantity of combustible waste, which will supply additional energy to the process. It is not possible to generalize about the ability of such plants to introduce combustible wastes, or about their operators' willingness to do so.

Low temperature incineration (flames as low as 750°C) will damage the outer layer, rendering the product effectively useless. Even lower temperatures will disfigure the packages. On the other hand, unless the combustion is complete, there is a risk that toxic substances could be produced. **This approach is not recommended.** It should be noted that ad-hoc incineration, i.e. putting an accelerant on the products and lighting them is most likely to result in incomplete combustion, and high air pollution.

5.3 Selecting the options

* Where small quantities are involved, it will be difficult to implement the most environmentally appropriate solution. Use of a municipal waste collection could be considered for less than 20,000, and the IUDs put into a compacting truck.

For intermediate quantities, a waste collection firm may be willing to provide a dedicated truck, compact the contents with a witness present, and take the contents to the landfill. Some organizations have stationary rubbish compactors, which could also be used. In developed countries, where there is little incentive for people to sort through rubbish for articles of value, the precautions can be relaxed.

Where disposal of a larger quantity is concerned the environmental consequences should be considered more carefully, but there will be situations where there are no suitable high temperature incinerators, especially none with energy recovery (e.g., cogeneration) facilities.

If condoms are to be buried, shredding should be considered to prevent their sale or use if they were later found or dug up and to facilitate biodegradation.

The availability of the above options will depend on the location concerned.

INCINERATION

- High temperature incineration with energy recovery
- High temperature incineration with no energy recovery

LAND FILL

- Specific burial
- Established land field

RUBBISH COLLECTION

- Only if small quantities are involved *

ANNEXES

ANNEX I: DISPOSAL OF CONTRACEPTIVE WASTE AT A GLANCE

Method/Primary Ingredient	Disposal Method
Male condom (with primary packaging)	
Latex	• Landfill • Incineration
Female condom (with primary packaging)	
Polyurethane	• Incineration
Latex	• Same as for male latex condoms
Oral Pills (with primary packaging)	
Estrogen and Progesterone	• Landfill • Incineration • Encapsulation • Inertization (But only after separating the pills from the blisters. Blister materials can be incinerated or placed in a landfill).
Hormonal Patch (with primary packaging)	
Estrogen and Progesterone	• Landfill • Incineration (Plastics other than PVC blisters)
Hormonal Ring (with primary packaging)	
Estrogen and progesterone (the ring is made of plastic, so question is same as above)	• Incineration (Plastics other than PVC blisters)
Hormonal IUD (with primary packaging)	
Progesterone (plastic body, similar questions)	• Incineration (Plastics other than PVC blisters)
Implants (with primary packaging)	
Progesterone hormone in silastic rods	• Incineration (Plastics other than PVC blisters)
Injectable contraceptive (with primary packaging)	
Progesterone Glass vials/ampoules	• Landfill • Crush the vials/ampoules and then dispose through landfill
Copper IUD (with primary covering)	
Copper & Plastic	• Copper containing IUDs can be disposed of by incineration after removing from primary packing
Packaging materials and other related waste	
Paper, cardboard (Bio-degradable materials)	• Recycle, if possible • Landfill • Incineration

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ANNEX III: GLOSSARY OF TERMS AND ABBREVIATIONS

AIDSTAR	USAID's global HIV/AIDS project providing support and technical assistance to teams working across the world
Biodegradable	To be consumed by microorganisms and return to compounds found in nature.
CuIUD	Copper Bearing intra-uterine device
FEFO	First Expiry, First Out
FHI360	Family Health International, a non-profit human development organization
IUD	Intra-Uterine Device
ISO	International Organization for Standardization
ISO 17025	The main ISO standard used by testing and calibration laboratories
MOH	Ministry of Health
NGO	Non-Governmental Organization
HDPE	High-density polyethylene, a polyethylene thermoplastic made from petroleum.
PATH	Program for Appropriate Technology in Health
PVC	Polyvinyl Chloride
Shelf life	The length of time that items like pharmaceuticals, are given before they are considered unsuitable for sale, use or consumption.
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development
WHO	World Health Organization

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