



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 1 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

## **Karolinska Institutet's management system for the environment and sustainable development**

# **KIs rules for laboratory waste management and emissions of chemicals into wastewater**

Departments located at hospitals must comply with the hospitals' corresponding rules.

*N.B.: Material that has been in contact with the substances covered by this document should be handled according to the rules for the substance.*

## **Contents**

<b>Antibiotics (hazardous waste) .....</b>	<b>2</b>
<b>Biological waste .....</b>	<b>3</b>
<b>Ethidium bromide (hazardous waste).....</b>	<b>4</b>
<b>Photographic chemicals (hazardous waste).....</b>	<b>5</b>
<b>Packaging that has contained hazardous chemicals (hazardous waste).....</b>	<b>5</b>
<b>Chemical waste (hazardous waste) .....</b>	<b>5</b>
<b>Pharmaceuticals, including cytostatic drugs (hazardous waste) .....</b>	<b>7</b>
<b>Radioactive waste (hazardous waste) .....</b>	<b>8</b>
<b>Sharps waste (hazardous waste) .....</b>	<b>8</b>
<b>Infectious waste (hazardous waste) .....</b>	<b>9</b>
<b>Emissions into wastewater.....</b>	<b>11</b>

*Contact details and information about ordinary waste are listed in KI's environmental and sustainability handbook, found at [ki.se/hallbarutveckling](http://ki.se/hallbarutveckling).*



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 2 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

### **Antibiotics (hazardous waste)**

*What* Antibiotics intended for liquid culturing.

*N.B.:* Antibiotics used as pharmaceuticals for patients or animals and solid antibiotics (ampoules, tablets etc) should be handled as Pharmaceuticals, including cytostatics.

*Why* It is important to avoid emissions of antibiotics into the eco-system. Resistance developed may persist long after the antibiotic exposure. In addition, cross-resistance may lead to consequences that are difficult to foresee. Antibiotics that end up in municipal wastewater treatment plants destroy the bacterial stage of purification and in that way have further negative environmental impact.

A distinction is drawn between antibiotics with a short (easily degradable) and a long (stable) environmental shadow. The former may be poured down the sink in the small quantities used at KI, since they will break down before reaching the eco-systems. The latter require special treatment (boiling/autoclaving/pH treatment) before being poured down the sink.

This rule was formulated by Professor Ralf Morgenstern at the Institute of Environmental Medicine. Source: Antibiotika-Fibel, Gerg Thieme Verlag, Stuttgart, 1975.

*How* Antibiotics can always be treated as Infectious waste. Antibiotics that cannot be destroyed by boiling, autoclaving or pH treatment *must* be deposited as Infectious waste. If there is no contamination of infectious agents the waste can be deposited as Pharmaceutical waste.

In addition, there may be reason to deposit special antibiotics as infectious waste in cases where:

- a) characteristics are unknown
- b) the antibiotic is the last possible treatment for multi-resistant bacteria (e.g. Vancomycin)

KIs rules on handling on specific antibiotics are as follows:

#### *Beta-lactams:*

- *Penicillin, Ampicillin, Carbenicillin:* Easily degradable. Short environmental shadow, can easily be poured down the sink.

#### *Aminoglycosides:*

- *Gentamycin, Neomycin, Streptomycin (included in PEST), Geneticin (G418):* Is to be autoclaved (or boiled) before being poured down the sink.
- *Kanamycin:* Is not destroyed by normal autoclaving. Is to be autoclaved in a highly acidic pH before being poured down the sink or handled as infectious waste.

#### *Others:*

- *Chloramphenicol:* Tolerates boiling, but breaks down quickly in the environment. May be poured down the sink.



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 3 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

- *Amphotericin=Fungizone*: Is to be autoclaved (or boiled) before being poured down the sink.
- *Erythromycin*: Easily degradable. Short environmental shadow, can easily be poured down the sink.
- *Puromycin*: Is to be autoclaved (or boiled) before being poured down the sink.
- *Sulphadoxine*: Is to be autoclaved (or boiled) before being poured down the sink.
- *Tetracycline*: Is to be autoclaved (or boiled) before being poured down the sink.
- *Blasticidin*: Characteristics unknown. Is to be treated as Infectious waste.
- *Ciprofloxacin*: Tolerates autoclaving. Is to be treated as Infectious waste.
- *Enrofloxacin*: Is to be treated as Infectious waste.
- *Nalidixic acid*: Is to be treated as Infectious waste.
- *Vancomycin*: Highly stable, last antibiotic that is effective in treating multi-resistant staphylococci. Is to be treated as Infectious waste or, if possible, substituted.
- *Zeomycin*: Characteristics unknown. Is to be treated as Infectious waste.
- *Zeozin*: Characteristics unknown. Is to be treated as Infectious waste.

To summarize, antibiotics are, in the event of any uncertainty, to be treated as Infectious waste.

## Biological waste

*What* Human and animal body parts, tissues and organs, as well as anatomical preparations etc. - provided that they do not contain sharp objects! Biological waste fraction is only present at Solna Campus.

*N.B.: Human blood and blood products are regarded as infectious waste. Material that has been contaminated by human blood and blood products should be handled as infectious waste.*

*Why* For ethical reasons, biological waste is to be handled separately. There are compelling reasons for showing respect to those employed in waste disposal to avoid their being exposed to the sight or smell of biological waste.

*How* Biological waste must always be stored frozen.

Hazardous waste containers (black) are made of resistant plastics. These containers must be lined with an absorbent mat at the bottom, must not be filled above the "filling" line and must not weigh more than 12 kg. Seal carefully. Hazardous waste containers must be marked with a "Biologiskt avfall" label with all sections completed. Leave the container in the designated location at the department where it will be stored frozen.

Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 4 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		



Particularly bulky biological waste should instead be packed in doubled-up plastic bags. Plastic bags should be sealed carefully one by one using cable ties or the like. Mark and store as described above.

### **Ethidium bromide (hazardous waste)**

*What* Waste containing or contaminated by ethidium bromide or other substances with similar characteristics.

*Why* Ethidium bromide is a substance that is primarily used for DNA analysis. It binds to DNA and fluoresces under UV light. This enables DNA to be detected in a sample. The compound's ability to bind to DNA means that it may be hazardous to individuals who handle it, since it also binds to DNA in the human body and may cause heritable genetic defects (mutagen, class 1 or 2). There are alternatives to ethidium bromide that may be assumed to have similar effects on health.

However, the amount of ethidium bromide in gels and solutions used is so low that the compound products are not required to be classed as mutagenic under the requirements applied by Swedish public authorities. Irrespective of which classification is correct, there is reason to exercise caution when dealing with ethidium bromide. Furthermore, one should not ignore the fact that laboratory and service personnel may be exposed to many different substances and that additive effects of multi-exposure is by and large always unknown. Ethidium bromide may be absorbed via the skin. Nitrile gloves are said to provide an effective barrier against ethidium bromide.

*How* Highly concentrated solutions (>1mg/L) should be marked and deposited as chemicals waste.

Buffers and rinsing baths should be handled as Chemical waste, or may be treated using a "teabag"/Destaining bag, before pouring down the sink. If the concentration of ethidium bromide in the liquid is considerably lower than 1µg/l, the "teabag" treatment may be omitted and the liquid can be poured directly down the sink. The "teabag" should be handled as Chemical waste.

Contaminated material should be packed in doubled-up plastic bags. Plastic bags should be sealed carefully one by one using cable ties or the like. Mark and deposited as Chemicals waste.

Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 5 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

Teabags can be ordered by WVR: *AMRESKO Destaining Bags*.

## Photographic chemicals (hazardous waste)

*What* Developing fluid, fixing agent and film.

*Why* Contain chemicals hazardous to the environment and health.

*How* Should be handled as Chemical waste.

## Packaging that has contained hazardous chemicals (hazardous waste)

*What* The assessment of whether a container is to be regarded as chemical waste is based on the hazard symbols, the hazard codes and the risk phrases.

*Why* Packaging is to be classified as hazardous waste if it contains residues of, or is contaminated by, hazardous substances, such that the waste displays characteristics like toxicity and corrosiveness.

*How* Containers with the following symbols (new hazard symbols that will replace the existing ones are shown below the existing symbols) are to be deposited as Chemical waste, irrespective of the quantity of residue in the packaging (apart from empty methanol containers that can be handles as below).

T+: highly toxic  
T: toxic



C+(R35): highly corrosive



N: environmentally hazardous



Containers other than the above should be collected according to the nature of the material (glass, hard plastic etc) – *provided that they are dust- and liquid-free*.

*N.B.: Where there is any doubt, the packaging must always be delivered as Chemical waste.*

## Chemical waste (hazardous waste)

- What*
- Chemicals, reagent solutions, solvents, oils, paints, glues, disinfectants etc.
  - Certain objects containing environmentally-hazardous metals, such as mercury thermometers, lead X-ray aprons and lead containers for radioactive preparations.
  - Materials including for example gloves, paper towels and tubes/containers.



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 6 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

*N.B.: See also Emissions to wastewater and “Quick User Guide” for the most common chemicals.*

*Why* Safe handling of chemical waste is essential in order to avoid injuries or damage to the environment.

*How* **Packaging**  
All containers should be placed in a secondary container or in a tray to prevent possible leakage. The jar/bottle and its lid must not be affected by its contents. The original container is preferable since it resists the chemical in question. Contaminated material should be packed in doubled-up plastic bags and sealed one by one using cable ties or the like.

The container must be properly sealed.

*N.B.:* Avoid placing substances that may react with each other in the same packaging. Separate

- acids from bases
- ammonia from hydroxides and hypochlorites, and
- combustible substances from oxidizing substances.

If uncertain about the possible risk of mixing certain chemicals, advice a person with adequate chemical knowledge.

*Exemption no 1:* Smaller quantities of materials (excluding packaging) contaminated by chemicals marked with T+, T, C+ or N can be collected as “Infectious Waste” as this fraction is sent for incineration.

*Exemption no 2:* Contaminated material (excluding packaging) that has come in contact with chemicals other than those marked with T+, T, C+ or N is to be collected in a protective inner lining before collected in garbage bins.

### *Marking*

Chemical waste containers must be marked with a “Farligt avfall” label with all sections completed.

If a vessel bears the original marking - which accurately describes the contents - this needs only to have the waste producer’s name, department and telephone number added.

### *Collection*

The Chemical waste is deposited in the chemical waste room of the particular building.



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 7 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

At Campus Solna, each department is responsible for transportation of the chemical waste from the chemical waste room to KICK. At Huddinge and Novum the chemical waste is collected directly from the chemicals waste room

An absorbent e.g. Vermiculite must be easily available in the chemicals waste room in an event of spill.

See also: "Emergency procedure for larger spills and releases of environmental and health hazardous chemicals"

### **Pharmaceuticals, including cytostatic drugs (hazardous waste)**

- What*
- Pharmaceuticals including for example vaccines, antibiotics, cytostatic drugs and narcotic drugs.
  - Objects that have been contaminated with cytostatic drugs and other pharmaceuticals with long-lasting toxicity.
  - Packaging that has contained antibiotics.

*Exemption:*

- Cannulas should be regarded as Sharps waste.
- Packaging that has contained merbromin and chromic acid should be regarded as Chemical waste.
- Waste from clinical trials must be subject to particular procedures. Agreement must be reached with any sponsor and any pharmacy concerned.
- Radiopharmaceuticals should be regarded as Radioactive Waste.
- Pharmaceuticals containing toxic metals such as antimony, arsenic, lead, chrome and mercury should be regarded as Chemical Waste. This applies to, for example: Acetarsol, arsenic powder, lead acetate, Kalii stibyli tartras (potassium antimonytartrate), chromic acid (chromium trioxide), merbromin solution, silver nitrate solution, thimerosal solution.
- Dental care products and anaesthetic gas: Major volumes of dental care products such as Hart's chloroform and Chlumsky's solution, as well as anaesthetic gases such as Enflurane, Isoflurane, Halothane and Sevoflurane are to be disposed of in accordance with the procedures for Chemical Waste.

*Why* Emissions of pharmaceutical residues represent environmental risks. Pharmaceutical substances can be traced in water courses. These substances are in many cases hard to break down and may remain biologically active long after use. They may also be highly toxic, cause mutations or result in hormone imbalances. Antibiotics, hormone preparations and cytostatics are among the pharmaceuticals suspected of causing environmental problems.

*How* Hazardous waste containers (yellow) are made of resistant plastics. These containers must be lined with an absorbent mat at the bottom if they contain liquid material. They must not be filled above the "filling" line and not weigh more than 12 kg. Seal carefully. Hazardous waste containers must be marked with a "Cytostatika och

Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 8 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

Läkemedelsförorenat avfall” label with all sections completed. Leave the container in the designated location at the department. The area must be kept locked and must not be accessible to unauthorized persons.



Pharmaceutical liquid waste is to be collected in tightly sealable bottles/containers and placed in the designated hazardous waste container (yellow). Do not leave containers with liquid waste standing; see to it that they are removed at the earliest opportunity. They must be labelled “Waste Pharmaceuticals/ Kasserade läkemedel”.

Objects that have been contaminated with cytostatic drugs and other pharmaceuticals with long-lasting toxicity is first to be packed in a sealed inner lining before being placed in the container along with other Pharmaceutical waste.

The identity of the narcotics has to be removed before being placed with other Pharmaceutical waste. The disposal must be recorded in the ledger designated for the particular product. The entry must be witnessed by two authorized persons.

## Radioactive waste (hazardous waste)

See KI’s Local Regulations on Radiation Safety at Karolinska Institutet.

## Sharps waste (hazardous waste)

*What* Sharps waste is defined as *all* sharp objects, such as cannulas, syringes with fixed cannulas, scalpels, lancets, suture needles and glass slides. This applies even if there is no suspicion of any infectious agent being present.

*Why* Sharp objects that have been in contact with body fluids/other infectious agents may cause infection if exposed. As a result, the Swedish National Board of Health and Welfare has generally classified such objects as infectious. This waste is also classified as hazardous waste and as hazardous goods during transport by road. To avoid errors in handling, KI has decided to apply stricter rules and therefore classifies all sharps waste from the laboratory as Infectious waste.

*How* Minor sharps waste may be placed:

- straight in hazardous waste containers (yellow)
- in small jars/cans, which are then placed in hazardous waste containers (yellow)



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 9 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

- or in small hazardous waste containers (the same yellow hazardous waste containers, but with a capacity of 2-3 litres) with cannula remover.

Hazardous waste containers (yellow) are made of resistant plastics. These containers must be lined with an absorbent mat at the bottom if they contain liquid material. They must not be filled above the “filling” line and not weigh more than 12 kg. Seal carefully. Hazardous waste containers must be marked with a “Skärande/Stickande smittförande avfall” label with all sections completed. Leave the container in the designated location at the department. If the waste is stored in an area away from the department, the area must be kept locked.



### Infectious waste (hazardous waste)

*What* Infectious waste includes human blood and blood products, micro-organisms, cell cultures and materials that have come into contact with these items (i.e. gloves, pipettes, tubes, paper towels etc.)

#### *Exemptions*

- *solid* waste that has come into contact with *highly characterised* cell cultures (which has neither been genetically modified nor infected). Liquid waste is not exempt from the rule.
- Deactivated waste, but only if it has been deactivated in accordance with approved method(s) described below.

#### *Approved methods for deactivation*

- Autoclaving. This method renders all infectious waste, including spores, inert and can always be used for deactivation.
- Boiling/chemical treatment/other treatment. This method may be used only if it has been demonstrated to be effective against the agent(s) concerned.

#### *Special cases*

- The strictest rules on waste handling are to be applied in all parts of the laboratory. Example: Work on *salmonella* is performed in a laboratory where other activities are also carried out (non-infectious); in such cases, all waste is to be handled as if it were salmonella-contaminated.
- Antibiotics/cytostatics/chemicals etc are often used in the same experiments as infectious agents. These are often subject to separate rules on waste-handling. This

Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 10 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

mixed waste can always be disposed of as “Infectious waste”, but is not always deactivated via autoclaving/boiling/chemical treatment/other treatment.

- Micro-organisms in risk group 3/operational level R must be deactivated locally in accordance with approved instructions and may not be disposed of as Infectious waste.
- Solid waste that is exempt from the rule, or that has been deactivated, is to be collected in a protective inner lining and clearly marked to the effect that it has been deactivated, for example using autoclave tape or a written indication, before collected as Household waste. It is not permitted for “Skärande/Stickade smittförande avfall” labels to be used for this purpose. This is to ensure that all waste has been deactivated before it comes into contact with ordinary “Combustible waste”.

NB! Waste handling rules for genetically modified micro-organisms (including cell cultures, referred to collectively as GMM) are formulated locally when licences have been applied for/notification has been made.

*Why* This waste is classified as hazardous waste and as hazardous goods during transport by road.

*How* A risk assessment is the basis for handling infectious agents and this document should include waste management. The form BARA, available from [ki.se/biosakerhet](http://ki.se/biosakerhet), may be used for the risk assessment.

Infectious liquid waste is to be collected in tightly sealable bottles/containers and placed in the designated hazardous waste container (yellow).

Infectious solid waste is to be collected in hazardous waste containers (yellow).

Hazardous waste containers (yellow) are made of resistant plastics. These containers must be lined with an absorbent mat at the bottom if they contain liquid material. They must not be filled above the “filling” line and not weigh more than 12 kg. Seal carefully. Hazardous waste containers must be marked with a “Skärande/Stickande Smittförande avfall” label with all sections completed. Leave the container in the designated location at the department. If the waste is stored in an area away from the department, the area must be kept locked.



*It is absolutely forbidden to pour viable micro-organisms/cell cultures down the sink!*



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 11 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

## Emissions into wastewater

*What* The rules apply to research and training laboratories located in Campus Solna and Campus Huddinge and connected to the municipal wastewater treatment plants Käppalaverket on Lidingö and Stockholm Vatten in Henriksdal via the municipal wastewater network.

These rules represent an exemption to current rules and have been approved following communication with the appropriate public authorities and water treatment plants.

*N.B.: These rules cannot be applied by other organizations outside Karolinska Institutet without prior communication with the appropriate public authorities.*

*Why* KIs wastewater is sent to Käppala and Henriksdal treatment plants. The treatment plants are built to treat the pollutants normally found in domestic wastewater. Substances such as heavy metals, organic substances that are persistent, toxic, bioaccumulative organic substances or substances that adversely affect the denitrification process must not be poured into the sewer system.

*How* *Fundamental principle*  
All pure chemicals and preparations, which in terms of their chemical composition differ from normal household wastewater, are to be collected in waste containers and sent for destruction as chemical waste.

All other chemicals are to be dealt with as specified in the safety data sheet (see KI's chemicals register, KLARA). This means that only solutions that without any doubt whatsoever are totally harmless to personnel, sink traps, pipe systems, plumbers, the various processes of wastewater treatment plants, the Baltic Sea and its organisms, in both the short and the long term, may be allowed into the wastewater system.

### *Exemptions from the fundamental principle*

If a chemical that is not covered by the fundamental principle above is to be introduced into the wastewater, all three conditions described below must be satisfied:

1. What is involved are minor quantities of, for example, experimental residues or solvents that are difficult to collect during washing up etc.  
It is not permissible to pour out pure chemicals direct from the jar/can etc. This list is therefore not to be used for disposal of what is produced during chemical clear out etc. Check carefully that the solution does not contain any harmful chemical bi-products.
2. The pH value must be between 5 and 11.5. Highly acidic or alkaline solutions may damage the pipe system. As a result, the pH value must be adjusted.
3. The substance is one of the following:

*Vitamins, electrolytes, amino-acids, peptides, proteins, carbohydrates or lipids:* These substances are considered not to represent any significant environmental impact. Residues may be poured into the wastewater system.



Journal number: 1720/2011-019	Date (iss./rev.): 20110311	Page 12 of 12
Document name: KIs rules for laboratory waste management and emissions of chemicals into wastewater		
Issued by: Environmental Unit		
Approved by: Environmental Council		

**Inorganic chemicals:** The following ions in a solution of water may be poured into the wastewater system in small quantities, i.e. max. 1 litre/day per laboratory:

- Cations:  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Ti(IV)}$ ,  $\text{Mn(IV)}$  (N.B.: not  $\text{Mn(VII)}$ ),  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  $\text{Li}^+$
- Anions:  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{SO}_3^{2-}$ ,  $\text{SO}_4^{2-}$ , silicates, borates

**Organic chemicals:** Organic chemicals that are listed in the Quick User Guide (below) may be poured into the wastewater system in small quantities, i.e. around 1 litre/day per laboratory:

**Substances with risk phrases R34 and R35 (corrosive):** These substances may be poured into the wastewater unless they have other hazardous characteristics, and if they are diluted by flushing with copious quantities of water.

NB! Chemicals can only be poured out in the sink if there is no risk for personal ill-health.

**Radioactive isotopes:** Please see KI Radiation Safety Regulations.

*Quick  
User  
Guide*

In order to simplify the process, the Environmental Department has in association with the Karolinska University Hospital produced a basic list for handling residues from commonly occurring chemical products. The list has been approved by Stockholms Vatten and Käppala reningsverk. The list is included in the KIs environmental and sustainability handbook at [ki.se/hallbarutveckling](http://ki.se/hallbarutveckling).

See also "Emergency procedure for larger spills and releases of environmental and health hazardous chemicals" in the handbook.