



Safe use of pneumatic air tube transport systems for pathology specimens

Introduction

This information sheet provides advice for people who use pneumatic air tube transport systems to deliver pathology specimens around a hospital site. It aims to provide practical help in ensuring safe use of this method of transporting specimens and supplements more detailed guidance on the design, use and management of pneumatic air tube systems (see the *Further information* section at the end of the sheet).

The advice given here has been produced with help from the Department of Health, including its Executive Agencies NHS Estates and the Medical Devices Agency, the Public Health Laboratory Service, the Microbiology Advisory Committee and users of pneumatic air tube transport systems.

Background

Pneumatic air tube transport systems can provide a safe, efficient and rapid means of sending certain types of pathology specimens between hospital departments; for example, from operating theatres and out-patient clinics to the pathology laboratories. The use of these systems is increasing because they can improve specimen turnaround time, so patients and hospital staff can receive test results quicker. They also allow for more effective time-management of messenger staff by reducing the need to physically take specimens from one department to another.

The system is made up of a network of tubing typically constructed of steel or uPVC, connecting a minimum of two (but more usually several) station terminals where specimens may be received or placed for transfer. The specimens are put into special carriers for dispatch through the tubing. Transportation is effected by a blower unit which determines the flow of the carrier. Depending on the size of the hospital site, the network may be many thousands of metres long, with a number of send-and-receive stations. The system can also be split into zones, sometimes incorporating means to divert carriers to certain destinations, and all under the control of a central microprocessor or stand-alone computer.

The safe use of pneumatic air tube transport systems is fundamentally reliant on:

- the types of specimen suitable for dispatch;
- its design, notably of the specimen carrier; and
- giving staff the right information and training so that the proper operating and control procedures are always followed.

The law

When using pneumatic air tube transport systems, employers and employees have various duties under health and safety law. All pathology specimens may contain substances that are 'hazardous to health'. Many may contain harmful biological agents, including those samples not necessarily sent for microbiological identification; others may contain hazardous chemicals, eg specimens for histopathology contained in formalin fixative solutions.

The Management of Health and Safety at Work Regulations 1992 (MHSWR 1992) and the Control of Substances Hazardous to Health Regulations 1999 (COSHH 1999) require employers to:

- assess the risks to employees, the self-employed and the public from use of the system and from exposure to hazardous substances including biological agents (the risk assessment/COSHH assessment); and
- take action to prevent or adequately control that exposure.

Assessing the risk

When making an assessment, first look for, and identify, the hazards. Then decide who might be harmed, how this might occur, and evaluate the likelihood of those hazards causing harm. The significant findings of the assessment need to be recorded and subsequently regularly reviewed and revised if necessary. Thinking about the following issues can help form the basis of your COSHH assessment:

- Infectious, chemical or radiation hazards which may be present in pathology specimens.
- Scale of risk. Liquid specimens will present the most significant danger and so some may not be suitable for transfer in a pneumatic air tube transport system. More 'solid' samples are less likely to leak from the containers.

- Routes of transmission. Specimens which can present a danger include:
 - *blood* - may contain blood-borne viruses such as HIV, Hepatitis B and C (possible transmission by exposure through broken skin or inoculation);
 - *sputum* - may contain the bacterium that causes tuberculosis (possible transmission by inhalation of aerosol); and
 - *biopsies* - may contain formalin (possible exposure to harmful vapours).
- Risks from using different specimen containers. The type of container, whether plastic or glass, and how it is packaged in the tube system carrier (in a transport bag or any other form of secondary containment), may present hazards of leakage or breakage, thereby generating spills, aerosols and sharps dangers. Several specimens may be placed in a carrier, but to prevent spillage of contents, should not be packed too tightly or too loosely.
- The suitability of carrier design. The possibility of inadvertent opening, leakage or damage in transit may create a number of significant dangers.
- How to deal with incidents and decontamination. If the specimen contents of a carrier were to be spilled into the tubing system or at a station terminal you would need to assess:
 - the hazards of both specimen/carrier retrieval;
 - containment of any spillage;
 - decontamination of that spill; and
 - re-commissioning of the system.

Preventing and controlling the risk

After you have evaluated the likelihood of these dangers, focus risk control on the following **five** points:

- suitability of specimen type;
- carrier design;
- specimen packing;
- spillage containment/clean-up procedures; and
- information, instruction and training on proper use of the system.

Suitability of specimen type

Your local risk assessment needs to determine which types of specimen may present a significant risk to the health and safety of those using the pneumatic air tube transport system or other people who may be affected by its use. You need to decide whether to prohibit certain specimens from being sent in the tube system, or whether the measures required to ensure adequate control of exposure are both practical and sufficient. Generally, swabs, urines, whole blood, serum and plasma are acceptable samples to transfer. Culture specimens, including glass blood culture bottles and respiratory disease specimens, may not be suitable. The size or mass of the specimen may also need to be considered; heavy samples might get stuck in the tubing and cause blockages.

Carrier design

The safe use of a pneumatic air tube transport system is fundamentally reliant on the design of the specimen carrier. Carriers need to be suitably constructed, robust enough to withstand being sent through the pneumatic tubing and able to deliver a specimen without damage or deterioration. If any leakage or spill from the primary specimen container occurred the aim is to prevent that leakage escaping from the carrier. Many designs are available and their suitability will need to be assessed. The carrier needs to be positively secured before being put into the tube system. 'Snap-top' types may be more suitable than those with fastenable straps, or screw tops which may be more prone to accidental opening in transit or incorrect fitting before dispatch. Ideally, the contents of the carrier should be visible, so that any leakage can be seen.

Carriers need to be constructed from materials that can be easily decontaminated and withstand the effects of cleaning. Damaged or defective carriers should not be used.

Specimen packing

Most currently available specimen carriers are not 'leakproof'. Therefore, specimens should be packed in the carrier to prevent any leakage and so avoid contaminating the tubing system. One suitable method is to place each specimen in a plastic transport bag, which has an integral sealing strip and a separate pocket for enclosing the request form. This is also a useful way of separating specimens. If, for example, several blood tubes are put in a carrier and one is damaged, the others will not then necessarily be spoiled. Another useful precaution is to place absorbent wadding inside the carrier between the specimen bags. If enough wadding is used, it will absorb any leak and so prevent contamination of the outside of the carrier or of the tubing. It will also help to stop any specimen movement which might otherwise increase the possibility of damage.

Spillage containment/clean-up procedures

The aim of using a pneumatic air tube specimen transport system is to transport those specimens safely, ie to prevent damage, leakage or a spill of the potentially infectious or harmful contents from contaminating the tubing system. Adequate disinfection of soiled tubing would be difficult and in many cases not possible without some or complete dismantling of the system. Fumigation of the tubing with formaldehyde vapour is **not** recommended because it is not generally thought practical to ensure that the tubing network is sealable for vapour disinfection. There would also be complicated considerations of how to safely evacuate the formaldehyde before recommissioning the system and also validating the effectiveness of the procedure to ensure adequate contact, time and concentration of disinfectant.

If specimen carriers are received with indications of broken or leaking specimen contents, the reception staff should notify a senior member of the department to assess the nature of any damage and decide how best to deal with it. Staff need to wear disposable gloves of suitable material when they deal with known or potentially contaminated specimens. If the carrier contains a damaged specimen of unknown origin, it is best dealt with and opened within the confines of a microbiological safety cabinet. This will help ensure that any hazardous aerosols present are safely contained. Staff also need to take care with any hazardous sharp fragments. The damaged contents and carrier will need to be suitably disinfected or discarded as appropriate. In some instances it may be better to request a repeat specimen, although this might not always be possible. The local risk assessment may prohibit the use of the pneumatic air tube transport system for irreplaceable or 'one-off' specimens such as CSFs.

Information, instruction and training

It is essential that all users of a pneumatic air tube transport system receive suitable and sufficient information, instruction and training to enable them to

know the risks created by its use and of the precautions which are to be taken to control those risks. A procedure for supervision of the system's proper use in accordance with local Standard Operating Procedures (SOPs) also needs to be set up. This will help ensure that specimens are properly contained in a suitable, fastened carrier with sufficient packing if needed.

Further information

NHS Estates, an Executive Agency of the Department of Health, have produced detailed publications on the design, use and management of pneumatic air tube transport systems. They are entitled: *Health Technical Memorandum 2009 Pneumatic air tube transport systems, Design considerations and Good practice guide* and *Management policy* (1995).

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<p>This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.</p>

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