

CHAPTER 13

Hygiene

13.1 CHAMBER HYGIENE

13.1.1

In order to maintain the 'quality of life' and to reduce the probability of bacterial infections of the divers, it is absolutely essential that the highest standards of hygiene are maintained. Therefore, the following general rules should be observed:

- Keep the humidity in the region of 50 per cent.
- Separate the humid regions in the system from the living quarters by means of a partition or hatch. The positioning of the hatch should be such that accidental closure does not cause it to seal.
- Limit the use of sanitary fittings to one area, preferably the wet chamber.
- Ensure that no standing water (e.g., bilges, drain pipes, sanitary basins, etc.) is allowed to remain for any length of time.

13.1.2 Cleaning Procedures

- Thoroughly wash the area to be disinfected with 'Panaclean' or similar detergent solution.
- Rinse the area with clean fresh water using a sponge or rags.
- Wipe the area with 'Panacide' or similar antibacterial solution.
- Mop up or drain all puddles of the solution and allow to dry.

13.1.3 Precautions When Using 'Panacide' in Chamber

- Ensure that skin or eyes do not come in contact with the solution. If they do:
 - In eyes—rinse freely with warm water, follow with an examination by qualified medical staff.
 - On skin—rinse freely with warm soapy water.
 - Ingestion—will cause nausea. The person must be seen by a doctor informed of the nature of the material (commercial grade of Dichlorophen BP in the form of the sodium salt).

- After each application, ensure that no puddles remain.
- Materials used for handling the diluted 'Panacide' must be:
 - Rinsed with fresh water.
 - Where possible, stored outside of the chamber.

13.1.4 Mixing Procedures

'Panacide' Solution

- The commercial product is a reddish brown solution 40 per cent w/w which must be diluted with water in the ratio of 1:2000

| Panacide | Water |
|----------|-----------|
| 1 ml | 2 litres |
| 2.4 ml | 1 gallon |
| 12 ml | 5 gallons |

- Procedures for dilution
 - Check the volume of the container being used and half fill it with clean fresh water.
 - Slowly* add the required volume of the concentrated 'Panacide' solution so as to avoid precipitating the 'Panacide'.
 - Stir to mix thoroughly.
 - Finish filling the container to the required level with clean fresh water.
 - Stir again.
- For disinfection of the lavatory bowl, the concentrated solution must be diluted with clean fresh water in the ratio of 1:500.

'Panaclean' Solution

- The commercial product is supplied in a concentrated solution and must be diluted with water in the ratio of 1:100 before use.

| Panaclean | Water |
|-----------|-----------|
| 10 ml | 1 litre |
| 48 ml | 1 gallon |
| 240 ml | 5 gallons |

- dilute the 'Panaclean' following the procedures for 'Panacide' dilution.

13.1.5 Recommended Frequency of Cleaning

During Saturation

- a Critical areas such as the wash basin, shower, WC, and portions of the chamber adjacent to them should be cleaned three times a day.
- b Bilge areas in all chambers—once a day.
- c All surfaces in chambers—once every two days.

Bounce Diving

- a All chambers and surfaces once a day during frequent operations.
- b All chambers and surfaces prior to diving and those chambers used following the dive during infrequent operations.
- c All masks after each use.

13.1.6 Reporting

Entries should be included in the chamber or dive log indicating when cleaning with the 'Panacide' solutions was done and the extent of the cleaning accomplished (i.e., bilges, whole chamber, etc.).

13.2 PERSONNEL HYGIENE

13.2.1

During saturation it is important to maintain the rules of common sense concerning general hygiene to ensure the minimum opportunity for cross-infection from one individual to another. This can be accomplished in the following manner:

- a Change the linen and towels at a maximum interval of 4 days, preferably as frequently as possible. They should be soaked in 'Panacide' and washed in very hot water.
- b Divers should only use their own bunk.
- c Divers should be assigned a set or sets of headphones and use only those. They must be cleaned and disinfected between saturation exposures or before assignment to another diver.
- d Diving suits and the rubber portions of mask/helmet should be locked out for cleaning and disinfecting between dives. Each diver should use as much as possible the gear strictly assigned to him.

- e Masks and breathing apparatus should be cleaned and disinfected between dives.
- f Divers checked to ensure that they observe normal individual hygiene.
- g Clothing should be changed at maximum intervals of every two days, more frequently is preferred. Clothes to be returned to the divers should have been cleaned in the same manner as linen and towels.

13.2.2 Ear Drops—Prophylactic (Preventative)

- a Each diver is to be given two bottles of prophylactic ear drops (Otic Domeboro) labelled with his name and whether for the right or left ear.
- b These drops should be used at least four times per day, particularly as soon as possible after diving or showering.
- c Application technique.
 - Have diving partner place drops in ear ensuring that the correct bottle is used for each ear.
 - Lean the head to one side and using dropper, place 4–6 drops in the auditory canal. Do not insert the dropper into the canal and take care that the drops and dropper do not contact the rest of the ear.
 - Keep the head bent for 15 minutes, gently massaging the cartilage in front of the ear in a circular manner to ensure full penetration of the canal by the drops.
- d If therapeutic drops are prescribed, the use of prophylactic drops must be *stopped* during the course of treatment.
- e Prophylactic ear drops should continue to be used for 24 hours following surfacing from decompression. At the end of that period, any remaining contents of the bottles should be destroyed.

13.2.3 Ear Drops—Therapeutic (Treatment)

- a These drops contain antibiotics and *must not* be used for prophylactic purposes.
- b They are to be used only by those persons who have been confirmed as having abnormal ear bacterial cultures and then only when authorized by responsible medical authority.
- c Use of the therapeutic drops must continue for the entire period specified by the responsible medical authority (normally 7 days) even if the diver surfaces, or symptoms cease within that period.
- d Prophylactic drops for the ears *must stop* when therapeutic drops are started.

- e The diver is to be given two bottles of therapeutic drops marked with his name and whether for the right or left ear. These should be checked to ensure that they are still 'in-date'.
- f Application technique
Same as for prophylactic drops except: 4 drops 3 times per day; drops need remain in the diver's ear for 5–10 seconds each.

13.3 BACTERIOLOGICAL SWABS

13.3.1 General

- a During a prolonged exposure to an elevated pressure and a helium–oxygen atmosphere with high humidity, the diver loses much of his natural resistance to bacterial and fungal infections. The gram-negative bacilli become prevalent during saturation conditions if high standards of hygiene, both chamber and personal, are not maintained.

One of the more infectious of these bacilli is the *Pseudomonas pyocyanus*, or 'pyo' for short. Normally carried in the intestine, where they do not cause the diver any problems, they will appear in the ears after 4–5 days in saturation. If their growth is not prevented, they will cause severe infections and pain after 9–10 days.

Therefore bacteriological swabs are used to ensure that divers going into saturation do not start off with an infection and once in saturation, to monitor the appearance and aid in the control of any bacteriological infections.

- b Frequency of sampling.
Selected surfaces in the chamber, especially around sanitary fittings, should be taken daily as long as possible following cleaning.
Every second day for divers in saturation.
- c Preparation of swabs for sampling—responsibility of the Life Support Technician:
Label each tube before opening with: contract number, vessel, or work site; date; diver's name and ear or the precise location in the chamber to be sampled.
Break the seal to remove the cotton swabs and moisten with sterile water; ensure that the swab is only handled by the end cap; ensure that the swab comes into contact with *only* the sterile water, the sterile water bottle, and the interior of the protective tube.
Return the swabs to their protective tube, closing but not sealing the tube so that it is not crushed when compressed.
Send the tubes into the chamber in a container or stand that allows them to remain vertical.

13.3.2 Sampling From Chamber Surfaces (Diver Action)

- a Check location to be sampled from label.
- b Remove the swab from its tube and rub it on the selected surface.
- c Replace swab in its protective tube, closing but not sealing the tube so that it does not explode when decompressed.
- d Return all swabs to the vertical storage device and pass them out of the chamber when sampling is complete.

13.3.3 Sampling From People (Diver Action)

- a The diver cannot take a proper sample from his own ear so another diver must do it for him.
- b Diver to be sampled should be seated and attempt to remain as still as possible.
- c The diver taking the swab:
Removes the swab from the tube handling it by capped end only, checking the ear to be sampled and that the diver is correct.
Removes any hair covering the ear to be sampled.
Pulls gently upon the ear to expose the ear canal.
Places the swab gently and slowly in the ear canal, only until the end has completely disappeared into the canal.
DO NOT FORCE IT, never go too far.
Do not twist swab, just insert and remove.
Withdraw the swab and replace it in its protective tube, closing, but not sealing the tube so that it does not explode when decompressed.
Ensure that the swab touches nothing but the interiors of the proper ear canal and the protective tube. If anything else is touched by the swab, it *must be discarded*.

13.3.4

Swabs must arrive at the laboratory within 24 hours of being taken. If delays are likely to prevent a rapid delivery, the swabs should be stored, when and wherever possible, at 4°C. The company office to which they are being sent should be notified by radio, telephone, or telex that the swabs are on the way, type of transport, time of departure, and estimated time of arrival at collection point.

13.3.5

The base office should transmit the results of the samples as soon as they are known, indicating the specific measures to be taken for each abnormal culture.