Throughout the United Kingdom around one thousand people die from drowning each year but perhaps as many as ten times this number come close to drowning. Analysis of the deaths shows that three times as many men die as women, almost a third have appreciable amounts of alcohol in the blood at the time of death, most are at least able to swim and the majority drown within ten metres of the shore, as reported by the Working Party on Water Safety in 1977.

Clearly, if a person who is quite unable to swim falls into deep water he or she may drown but this is by no means a certainty. The body comprises 90% water and a little fat; and fat being less dense than water provides buoyancy. When the chest is fully expanded and breath held displacement is increased and since the mass does not change the body floats higher in the water. It follows that people who are very densely muscular and with little sub-cutaneous fat float less well than fat people. Almost without exception young males of African descent sink in fresh water while most European women float. Salt water being more dense than fresh provides added buoyancy which is why it is easier to play water polo in salt water.

So, even a non-swimmer is able to avoid drowning if he or she simply kicks gently and breaks surface often enough to take a breath. This simple act of co-ordination is lost the moment the victim begins to panic: it is also lost when he or she breathes too rapidly.

A beautiful piece of research by Golden and Hardcastle in 1982 has highlighted the importance of this rhythmical breathing pattern. Ten highly capable young swimmers volunteered to swim for ten minutes clothed and unclothed, first in warm water (25°C) and then in cold (6°C). The oxygen consumption of each swimmer was measured to provide an estimate of the amount of effort put into the stroke. None of the swimmers had any difficulty in warm water however, in cold only three completed the ten minutes, some having to be lifted from the water after as little as two minutes swimming. In the subjects who gave up, oxygen consumption was not significantly different to their consumption whilst swimming in warm water and so failure to swim could not be attributed to fatigue alone. The big surprise came when the breathing rate of each swimmer was analysed. Those who failed in cold water increased their respiratory rate by as much as 122% above that when they were swimming in warm. In contrast those who completed the swim in cold water increased their breathing rate by only 35%. It was concluded that failure to swim was due to an increase in the respiratory rate resulting in loss of co-ordination.

The immediate effect of sudden immersion in cold water is to cause rapid panting. This is an irrepressible reflex which may in some cases be so vigorous as to result in tetany. It is essential during this period of acclimatisation that the swimmer is able to stand on the bottom so that his head can be held above the water. Moreover, the same reflex also results in spasm of the coronary arteries. Doctors investigating angina use this test deliberately to bring out abnormalities in blood supply to the heart simply by asking the patient to dip a hand into a bucket of ice cold water. It is highly probable that total immersion in very cold water has caused fatal spasm of coronary arteries even in people with normal hearts.

These static experiments have all been performed in completely flat water but in reality such conditions seldom prevail. Studies of the floating potential of life jackets performed in wave tanks show that if the water chops to more than 4 feet waves may break into the patient's face. If then he should become unconscious he would drown despite wearing a life jacket. In rough water without any added buoyancy the head is submerged by each wave that passes.
Conditions in the field are seldom ideal. This victim of the Fastnet race was 18 hours in the water before help arrived. Acknowledgement to the Photographic Department of the RNAS, Culdrose.

In the light of what is now known it is easier to understand the disastrous events which led to the deaths of three young police officers off Blackpool seafront earlier this year. The casualty was within a few feet of the harbour wall and the rescuer was a good swimmer, however, the sea state was bad due to backwash from the harbour wall. The only way to enter the water in such conditions was to plunge from the wall. The water temperature at that time of year, depending upon wind direction, varies between 6° and 9°C. The life buoys did not give sufficient buoyancy to those in the water.

Few realise that remarkable escapes from death are not unusual in near-drowning. Humans have been known to survive total immersion in water for up to forty minutes and yet, as reported by Siebke and co-workers in 1975 to recover without brain damage. The physiological reasons for such miraculous recoveries remain speculative but many now believe that though breathing stops shortly after submersion the heart continues to beat for a time. This allows the body to cool while at the same time the brain receives its blood supply. If the body becomes cool enough all circulation can stop for up to 20 minutes without resulting in brain damage. This fact has been used in the field of open heart surgery where hypothermia is a well tried technique still in use in certain centres treating paediatric cardiac abnormalities.

The rule is never to assume that the victim of immersion is dead. Pupil size, skin colour and absence of pulse are totally unreliable signs as pointers to death. Mouth to mouth resuscitation alone may be all that is required (never Holger Nielson’s method) but the rescuer should be prepared to persist for up to an hour.

Water safety has been hammered for years in the press, in local authority hand-outs, by both the famous and infamous and more recently by radio and television broadcasts. Despite all this there has been little change over the years in the number of people drowning. Perhaps we are now beginning to understand at least some of the reasons why drowning occurs and perhaps as a result of reading this at least drowning will not be the cause of your demise.

A simple resuscitation guide containing instructions on cardio-pulmonary resuscitation for lay people is available from the Community Resuscitation Advisory Council, c/o Dr. D. Zideman, Department of Anaesthetics, Hammersmith Hospital, DuCane Road, London W12.

REFERENCES

