

Battery safety

Pupils and students must, of course, never build circuits that run directly from mains electricity. Batteries make a safe, effective substitute, provided you follow some simple advice.

There are two significant hazards in using batteries in school:

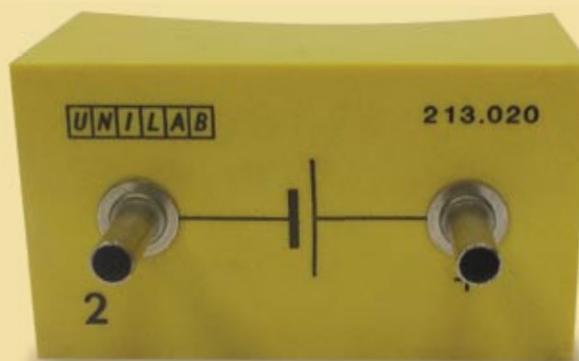
- Swallowing a small battery;
- Severe overheating due to short circuiting.

Swallowing

This only concerns "button cell" batteries. The hazard here goes beyond choking or poisoning. There have been a significant number of cases when toddlers have swallowed button cells that have become lodged in the oesophagus. The mucus in that part of the body forms an electric circuit with the battery, creating a chemical that can cause severe internal burns. Whilst it is most likely to be younger children who put button batteries in their mouths, older ones might also do so to try to feel the tingle of a mild shock. In general, you will only rarely use button cells at secondary schools. Having said that, these batteries are used in some remote controls, novelty toys, small torches, musical birthday cards and so on. If you have visiting primary or nursery children, do not let them have access to devices where the button battery can be removed without undoing a screw.



Figure 1 - The usual suspects – common sizes of battery. From left to right- D Cell, C Cell, AA, AAA, PP3 and button cell.



Overheating due to short circuits

When children wire up circuits, some inevitably make mistakes.

Short circuits cause overheating in wires and within batteries. Batteries may become dangerously hot and even burst, releasing hazardous chemicals. The battery drains quickly, but that is the least of our worries. The severity of overheating depends on the current. This is governed by the internal resistance of the battery which is determined by the battery chemistry. Rechargeable batteries have low internal resistances whereas that of zinc carbon or zinc chloride batteries is relatively high. Alkaline and lithium batteries are somewhere between. This leads us to issue the following advice:

- Do not use rechargeable batteries for circuits that pupils build.
- The best batteries to use are zinc carbon or zinc chloride.
- The best sizes are D and C cells. This is not a safety recommendation. Rather it is based on the longevity of the battery.

Alkaline and lithium batteries are not so prone to dangerous overheating as rechargeables, but they are not as safe as zinc chloride or zinc carbon batteries. At SSERC we always say that if there is a safer way of doing something that is not ridiculously more expensive or inconvenient, do it the safer way. Most people know not to mix old and new batteries in the same device. Do not mix battery chemistries either.

This only applies to circuit building - it is perfectly OK to use rechargeables, lithium and alkaline batteries in cameras, calculators etc unless the manufacturer says not to. Use the correct charger for your batteries and be aware that some chargers are smarter than others. Basic chargers work on timers whereas smarter ones monitor battery voltage and/or temperature. ▶

Health & Safety

Buying batteries

Buy from a reputable source. It is not always easy to work out whether a battery is, say, zinc carbon rather than alkaline. Beware of batteries that are the same size as AAA or AAs but are higher voltage, for example the 14500 battery used in e-cigarettes. This can have a voltage of 3.7 V. If in doubt, contact SSERC.

Storing and disposing of batteries

If equipment is not to be used for some time, remove the batteries to prevent leakage. Do not open battery packs until you need the batteries. Be careful how you store loose batteries or batteries in holders. Could a piece of metal (or another battery) cause a short circuit? As you should not throw batteries out with normal rubbish, most schools will have a battery bin. There are collection points for used batteries in some shops and at civic amenity waste sites. If disposing of batteries, tape over the terminals before putting them in the battery bin. Examples are shown in Figure 2. Keep the bin out of reach of small children.



Figure 2 - Taping batteries for safe disposal.

Eyelash mite - safety note

Demodex is a genus of tiny (0.3–0.4 mm) commensal mite, two species of which live principally in or near the eyelash follicles and their associated sebaceous glands of humans. The presence of *Demodex* increases with age, with an incidence of less than 25% in those under 20 years to almost 100% in those over 70 years. Density is higher in patients with blepharitis, rosacea and acne vulgaris. Infestation is usually asymptomatic, although high levels of infestation may cause inflammation.

Demodex are photophobic and tend only to appear on the skin surface at night. The most common method of sampling *Demodex* is by eyelash hair epilation. Sampling may also be done by skin scrapings. Samples are viewed microscopically using HP (x40) objective.

Sampling *Demodex* in schools is not recommended. The size, density and location of mites make it difficult to ensure that a sample will contain mites. In addition students may find it difficult to locate individual mites under the microscope. Also individuals with skin conditions about which they may be sensitive are more likely to produce samples with mites. The inevitable public exposure may

make them feel uncomfortable. Sampling mites by eyelash hair epilation must not be attempted in schools. Skin scrapings have been suggested using a glass microscope slide, long fingernail, side of a knife or spatula blade. None of these methods are recommended. It is a general rule that where samples are taken from human tissue, students must only work with their own samples. Such sampling methods should use sterile, single use disposable instruments (e.g. the ice cream spoons sold with small cartons of ice cream can be purchased in bulk relatively inexpensively and would suffice for a skin scrape). However the suggested method of obtaining a skin scrape sample suggests exerting a significant degree of force to express sebum. The exertion of a degree of force is not recommended.

References

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