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## Evidencing best practice in post-excavation and long-term storage protocols for archaeological iron

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Archaeological iron excavated from damp soil usually contains free water within corrosion product layers. This water can create high humidity environments around objects post-excavation and form an electrolyte which enables electrochemical corrosion processes to occur. Archaeologists and conservators frequently store freshly excavated objects in plastic boxes and make decisions as to whether to dry objects before storage and whether to use silica gel to desiccate the environment. Guidelines on best-practice protocols for drying and immediate post-excavation storage are limited and conflicting in the advice they offer, leading to ad-hoc practices, no standardisation of procedures and consequent danger to objects.

Once dry, chloride-bearing compounds within corrosion product layers can cause iron objects to remain unstable down to 15% relative humidity (RH). For most museums and archaeological units, effective, long-term corrosion control is by desiccated storage which relies on being able to create and maintain low RH microclimates in plastic boxes. Variables driving the success of microclimate creation and retention are the air exchange rate of the box and the mass of dry silica gel contained. These are affected in turn by factors inherent in box design and size. Data generated at Cardiff University shows that generic recommendations for storage box selection do not reflect differences in their performance.

This paper delivers new data on the influence of post-excavation drying, storage box variables and mass of silica gel on the possibility of creating desiccated microclimates for immediate and long-term safe storage of archaeological ironwork. Combining this with corrosion rate data for iron objects at humidities from 20-80% RH allows predictions to be made about the risk to objects from following a range of common protocols. Maintenance regimes for regeneration of silica gel can be projected and cost-benefit assessed based on balancing humidity and risk against staff resources. Guidance on best-practice drying and storage procedures to minimise corrosion and enhance object longevity can now be offered to archaeologists, conservators and the wider museum sector.