Dragon's exhalations give clue to Chernobyl

SIR—Reading the letter from Liverpool University concerning the origin of $^{110}Ag_m$ in beef and lamb liver (G.D. Jones *et al. Nature* **322**, 313; 1986) I was reminded that this isotope was well known as one of the more mobile fission product species in the ceramic fuels of the prototype high temperature gas-cooled reactor (Dragon) at Winfrith. It was produced, not from ^{110}Cd, but by epithermal neutron capture on ^{109}Ag. The yield was greater in ^{239}Pu fission than in ^{235}U fission but it was a prominent mobile species in both cases. It appears that $^{110}Ag_m$, whilst less volatile than ^{137}Cs in the elemental state, is capable of relatively rapid surface diffusion in graphite. Consequently, the gases released from the burning moderator graphite at Chernobyl would be expected to contain some $^{110}Ag_m$.

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Decontamination puts meat in a pickle

SIR—Meat from game, cattle, sheep and reindeer is still heavily contaminated with ^{134}Cs and ^{137}Cs from the Chernobyl nuclear accident. Scandinavia presents a particular problem, especially the reindeer in Lapland, but there is also contamination elsewhere in Europe. Since caesium, like sodium, is an alkali metal, we have attempted to substitute sodium for ^{137}Cs by pickling contaminated venison.

A leg of venison from a roebuck which was shot in the Schwaebische Alb mountains near Tübingen on 1 June 1986 contained 570 Bq (15.4 nCi) ^{137}Cs per kg, which corresponds to 178 pg (1.3 pmol) of radioactive caesium per kg meat. The leg was put into eight times its weight of a brine containing 100 g per litre (1.7 M) NaCl and 3 g per litre (29.7 mM) KNO_3. After three weeks, the radioactivity of the meat had dropped to 70 Bq (1.9 nCi) per kg (and it tasted very good). Similar results were obtained with livers, kidneys and hearts from two other roebucks.

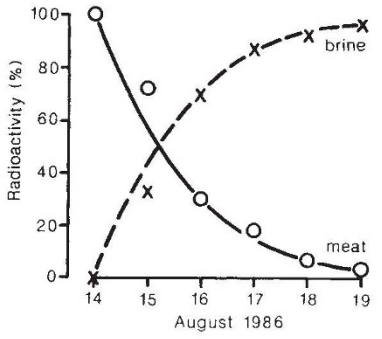

Fig. 1 Extraction of ^{137}Cs from meat by pickling in salt solution. The 100% value for the meat represents 218 Bq per kg. Cumulative values are shown for the brine.

Further investigation showed that potassium is a dispensable constituent of the brine. A typical example of extraction with NaCl alone is shown in Fig. 1. One kilogram of roebuck leg, containing 218 Bq ^{137}Cs, was cut into approximately fifty pieces to which were added 100 g crystalline NaCl and 500 ml 1.7 M NaCl solution. Each day thereafter, the meat was removed from the brine and washed with 100 ml water. The radioactivity of the meat and the brine was measured and the meat was repickled in a litre of 1.0 M NaCl solution. After five days the meat contained less than 5 per cent of the initial radioactivity.

We assume that meat from other animals could also be decontaminated by pickling with a large excess of sodium ions over caesium ions, of the order of magnitude of 10^{12} in this case.

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Body in the bog but no DNA

SIR—The isolation of partially degraded DNA from dried tissue of a museum specimen of the extinct quagga (*Equus quagga*) and its hybridization with DNA from the closely related zebra (*E. zebra*)[1] stimulated wide and sometimes wild speculation on the prospects of, genetically speaking, "raising the dead and buried". Commenting in News and Views on this important work, Jeffreys opened the challenge to museum curators to "be reasonably sympathetic to hordes of molecular biologists eager to dismantle their cherished exhibits" and alluded to the possibility of sequencing DNA from Egyptian mummies and from bog-bodies[2].

Since then, cloning of a small fragment of DNA from one of 23 Egyptian mummy samples examined has been described[3]. With the discovery in 1984 of the British bog body — Lindow Man[4] — the opportunity arose to attempt to isolate DNA from peat-preserved human remains, although after about 2,500 years in an aqueous environment of *p*H 4.5–5.5, and with the expected rate of depurination, little if any undegraded DNA was anticipated to be present.

Samples of psoas muscle were removed for DNA analysis at a very early stage in the conservation of the body and stored in sterile containers at −60°C with maximum precautions to avoid contamination with modern microbial DNA. We first attempted but failed to isolate DNA following well-established methods, examining the product by gel-electrophoresis, restriction enzyme digestion and hybridization to ^{32}P-labelled human ribosomal RNA. Then, in order to detect DNA degradation products such as oligonucleotides or apurinic acid, cell extracts were treated with alkaline phosphatase and then incubated with high specific activity [γ-^{32}P]ATP and T_4 polynucleotide kinase, but again without success. Similar results were obtained in experiments with peat samples taken from around this body during excavation, while fresh human tissue produced the expected DNA and its degradation products.

Thus, while a little DNA may be preserved during the dehydration process of Egyptian mummies, probably none survives the acid, aqueous, anaerobic and virtually sterile preservation conditions of bog-bodies, and hope of cloning the genes from Iron Age Man will probably not be fulfilled.

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Out of Africa — through a genetic bottleneck

SIR—Giles and Ambrose[1] are correct to say that the phenetic analysis of β-globin gene data by which Wainscoat *et al.*[2,3] and others[4] have grouped Africans apart from other human populations should not have been interpreted as a phylogeny, because of ambiguous character polarities. Jones and Rouhani[5] agree that the assumed polarities in their model of a genetic bottleneck are arbitary, but offer no means of resolving the ambiguity. But by examining the β-globin gene clusters of the great apes it may still be possible to ascertain whether the African haplotypes were present in ancestral human populations and subsequently gave rise to the non-African haplotypes, as concluded by Wainscoat *et al.*, or whether the reverse is more likely.

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