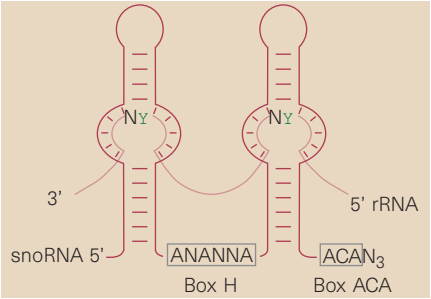

Figure 2 **Selection of site(s) for ψ modification in ribosomal RNA occurs in a 'window' in either a 3′ or 5′ interrupted hairpin of small nucleolar RNA (snoRNA). The target rRNA and snoRNA (which is characterized by the sequence ACA, three nucleotides from the 3′ end) contain complementary sequences that hybridize to one another. In double-stranded RNA, the ψ synthase would be unable to gain access to the target uracil base, but the unpaired window opens up the structure to allow the enzyme in. (Reproduced from ref. 3.)**

genes in yeast rRNA, and used the Bakin and Ofengand method to examine 30 of the 43 known ψ sites. For 10 of the 16 ACA snoRNAs that were disrupted, deficiencies of single ψ modifications were found at specific sites in 18S and 28S rRNA. For several of the ACA snoRNAs, complementarities between the snoRNAs and rRNA tracts immediately preceding the ψ sites were identified. These were shorter than the 12-base-pair complementarity tracts in D-box snoRNAs. Mutations that reduced the complementarity disrupted ψ formation. Moreover, when Ni *et al.* altered the distance from the ACA box in snoRNA to the target nucleoside in rRNA, an adjacent uridine in rRNA was converted to ψ.

The studies by Ganot *et al.*[3] encompassed not only yeast rRNA, but also human and *Tetrahymena* rRNAs and their cognate ACA snoRNAs. They identified 17 potential interactions between human ACA snoRNAs and rRNA, 19 interactions in yeast and four in *Tetrahymena*. Interestingly, the human interactions included the two ψ sites in 5.8S rRNA. This small molecule is functionally a part of the 28S rRNA subunit, but the two are separated by about 1 kilobase of transcribed spacer in human pre-rRNA. So, the same principles apply for modification of the small 5.8S sequence within pre-rRNA as for the 18S and 28S sequences.

Ganot *et al.* more fully defined the interactions between ACA snoRNAs and pre-rRNA. There are two tracts of base-pairing between each snoRNA and rRNA, leaving the rRNA target nucleoside and one adjacent base in an unpaired 'window' (Fig. 2). When the authors knocked out (separately) the genes for two yeast ACA snoRNAs, they were able to inhibit ψ formation at predicted sites in rRNA. One of these genes, *SNR5*, mediates two pseudouridylations, fairly near to each other in 28S rRNA. The other, *SNR36*, mediates ψ formation at a specific site in 18S rRNA. When the *SNR5* and *SNR36* genes were restored, ψ formation resumed.

For the formation of ψ (Fig. 1), the ψ synthase must gain access to the uracil base in a manner that would be difficult or impossible in a double-stranded region. Positioning of the target nucleoside in the window (Fig. 2) is, therefore, an attractive feature. In another study, Bousquet-Antonelli *et al.*[4] showed that ACA snoRNAs mediate ψ formation in conjunction with a nucleolar protein called Gar1. A temperature-sensitive mutant of Gar1 cannot form any ψ at the non-permissive temperature. But Gar1 shows no homology to any of the known ψ synthases[12] (characterized for tRNA and *Escherichia coli* rRNA). So Gar1 may not be the enzyme but, rather, a factor that aids association between ACA snoRNA, rRNA and the ψ synthase.

Characterization of the presumed nucleolar ψ synthase and the 2′-*O*-ribose methylase are now outstanding goals. SnoRNA-depletion experiments have shown that many of the ψ residues and ribose methyls are, individually, nonessential for viability. So, we need to know what the fine-tuning effects of these modifications are. Whatever the future may hold, however, the mechanism of site-selection for the numerous ψ residues and ribose methyls in eukaryotic rRNA has essentially been solved, in this remarkable series of experiments defining the roles of the two families of guide snoRNAs. □

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Erratum

In James Binley and John P. Moore's News and Views article of 22 May ("HIV-cell fusion: The viral mousetrap" *Nature* **387,** 346–348; 1997), acknowledgement for the origin of Fig. 2 should have appeared as "Adapted from Fig. 2 of reference 5" (Gallaher, W. R., Ball, J. M., Garry, R. F., Griffin, M. C. & Montelaro, R. C. "A general model for the transmembrane proteins of HIV and other retroviruses", *AIDS Res. Hum. Retroviruses* **5,** 431–440; 1989). In the same article, the references in the passage, "Moreover, soluble CD4 can activate fusion of ... HIV-2 (ref. 13) and some primary forms of HIV-1 (ref. 12)..." were transposed and should have been printed as they are here.

Daedalus

Droplets of gas

Even in a well-insulated vessel, a cryogenic liquid such as oxygen slowly evaporates as heat leaks into it by all possible routes. One route is usually impossible — conduction or convection from the vapour above the liquid. The steady upward flow of evaporated vapour prevents heat being conducted downwards.

Daedalus is now generalizing this idea. Imagine, he says, a spherical droplet of a liquefied gas, evaporating outwards evenly in all directions. Both conduction and convection would be frustrated, pushed away by the radial outflow. Only radiation would remain to be countered.

So DREADCO technicians are fabricating little spheres of microporous carbon aerogel, and fluorinating their outer surface to limit its wettability to liquefied gas. An outer coating of reflective metallized foam completes the DREADCO 'cryogenic bull's-eye'. A bull's-eyes can be loaded with liquefied gas simply by dipping it deeply in the liquid. But when it is removed, only its outer metallized coating drains dry. The liquid in the microporous core is trapped by its non-wetting outer boundary. It evaporates very slowly, its radial passage outwards preventing heat from leaking in. Each bull's-eye can hold many times its own weight of liquid.

The first application will be an update of an old DREADCO invention, a pill to be swallowed in case of fire. It reacted chemically in the swallower's stomach, releasing oxygen for him to 'digest'. He could stop breathing, and walk to safety through the thickest and most toxic smoke.

An edible oxygenated cryogenic bull's-eye, exhaling oxygen at a steady rate, would do the job far more neatly. Similarly, a bull's-eye loaded with liquefied anaesthetic gas might be swallowed as a 'knockout pill'. Its reliable, automatic delivery would make surgery much safer. But Daedalus hopes to perfect cryogenic bull's-eyes with even lower loss-rates. They will at last tame methane and hydrogen for automotive use. Safely and almost permanently liquefied inside a charge of bull's-eyes, these tricky fuels could be poured and stored like so much coal. Once in the vehicle's fuel tank, they would be evaporated by a microwave heater, acting on the bull's-eyes' carbon aerogel cores and controlled from the accelerator. When the bull's-eyes had boiled dry, they could simply be exchanged at a filling station for full ones. Smelly, polluting petrol would at last be replaced by its clean and ecologically virtuous rivals.

David Jones