are truly recessive. Dosage of mutant alleles must be considered; and whether, in the case of mutations which occur exclusively in somatic cells, conversion from loss of one copy to loss of both copies is important in tumour progression.

Perhaps the phenotypic effects of the germ-line loss of a single copy of some suppressor genes could have been predicted from the evidence of the various syndromes of developmental abnormality in man which are associated with chromosome deletions. Overlap between these and the inherited cancer syndromes may be provided by syndromes of developmental abnormality in which tumours are an occasional feature. In dominantly inherited diaphyseal aclasia (multiple exostoses), for example, there is defective modelling of the ends of long bones with persistence of excessive cartilage and, in about 2 per cent of individuals, development of chondrosarcoma. In such cases, investigation of the tumours for allele loss might reveal the location of genes important in development.

A different speculation arising from gene dosage is prompted by reports[9] that allele losses on chromosome 11p in a few cases of sporadic Wilms tumour show a bias towards retention of the paternally derived chromosome in the tumour. If these reports are confirmed by analysis of further cases, several explanations can be envisaged; but the implication is that there is a difference between the maternal and paternal chromosomes in this region, raising the possibility of epigenetic effects caused by genomic imprinting. There is no evidence for widespread functional hemizygosity in adult tissues as a result of inactivation of genes by this mechanism, but perhaps more subtle variations in activity could occur and could be revealed by bias in allele loss of this sort.

Tissue specificity

A remarkable feature of inherited cancer syndromes is their tissue specificity. Often, however, the pattern of tumours does not accord with any current ideas of physiology or cell lineage. The concurrence of retinoblastoma and osteosarcoma, or of colonic carcinoma, hepatoblastoma, thyroid cancer, carcinoma of the Ampulla of Vater and fibroblastic tumours in Gardner's syndrome, for example, is quite unexplained. Presumably, this implies either the existence of physiological or lineage relationships of which we are unaware, or that the same gene is used for a controlling function in several separate lineages. The allele losses in Table 2 suggest some possible patterns: for example, losses of chromosome 1p or 22 in tumours of neuroectodermal tissue, and of 3p in each of the different histological varieties of lung cancer; but others do not fit. But care is needed. The results are biased towards losses of alleles on a few chromosomes because these are the ones which have been tested; moreover, most of the losses have not been precisely localized, and an association may easily be created or obscured by assuming that all losses on a single chromosome arm reflect changes at a single locus. More complete information is needed.

Curiously, the one case in which there is detailed information has merely added confusion. The retinoblastoma gene is expressed in a wide variety of tissues, yet germ-line mutation results in a clear predisposition only to retinoblastoma, osteosarcoma and possibly melanoma. The finding of structural changes or homozygous losses confined to the putative retinoblastoma locus in a few small-cell lung cancers[10] and breast cancers[11] provides a further paradox. Without evidence of germ-line losses in these cases, it is likely that the double loss was a purely somatic event: but even so, some relationship between inherited predisposition to retinoblastoma and to these tumours might be expected. At present the only evidence of this is a reported increase in pre-menopausal breast cancer in the mothers of children with soft-tissue sarcoma: longer follow-up of retinoblastoma survivors is needed to be sure on this point. It seems we must distinguish between the tissue specificity of expression of the retinoblastoma gene and the expression of the phenotypic effect of its mutations. About the expression of the mutations, there is clearly much to learn. □

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Bruce Ponder is in the Section of Human Cancer Genetics, Institute of Cancer Research, Sutton, Surrey SM2 5NG, UK.

Daedalus

With bated breath

Noise is the curse of our civilization. From transport, industry and so-called entertainment it assaults us constantly. Daedalus is now fighting back. His new sound-deadening scheme exploits the fact that sound is strongly muffled by fog.

The reason is obvious. At the peaks of the sound-pressure cycle, water vapour condenses on the droplets, lowering the air-pressure, while at the troughs it evaporates from them, raising the pressure. The suspended droplets thus act as a buffer, absorbing the sound. A boiling kettle, however, is a limited defence against sonic assault. Its swirling mist does a better job of obscuring vision. This double inefficiency could be neatly reversed by making its mist droplets smaller. They would then cease to scatter light, being less than a wavelength across; and their total surface area would rise, letting them equilibrate faster and more perfectly with the water vapour in the air, and deadening its vibrations more completely.

But how to generate and stabilize ultra-small water droplets? The high surface tension of water gives their sharply curved surface an excessive vapour pressure; they evaporate, and their vapour goes to swell bigger droplets. A suitable detergent, however, could lower their surface tension and stabilize them against this form of evaporation. Many organic compounds are volatile in steam, and Daedalus is confident of finding a suitable detergent among them. Thus will be born the DREADCO Hushkettle®, which pours out a long-lasting, invisible fog of ultra-small water droplets. Their enormous total surface area will simply swallow up all sound entering the region.

At last the sonic menace will be beaten! The householder beneath the airport flight path; the passenger on public transport cringing from the cacophony of competing cassette-players; the restaurant patron shouting to converse above the alleged 'background' music — all will have a remedy close to hand. The soothing output of the Hushkettle will spread peace and quiet across the whole scene. Sound will still be audible a short distance from its source: owners of cassette-players will still be able to enjoy them, and friends will still be able to exchange close-whispered confidences. But such sounds will not get far. The throbbing public air will in effect be reduced to a set of private cells with no connection between them.

The Hushkettle could be misused, of course. It could reduce concerts and public meetings to total farce, and sabotage the courtship of cats, frogs and crickets. But its overall impact should be overwhelmingly positive. David Jones