as well as *tct*, a gene for interaction with *T* to produce loss of tails. Because it is clear that the biology of *t* chromosomes results from a series of genes spread over a large region, the term *t* mutation is not appropriate and most authors refer to the *t* complex. Most theories for the origin of the *t* chromosomes propose that the favourable combination of segregation-distortion genes is fixed by the recombination suppression and that the enormous advantage conferred on the *t* chromosomes by segregation distortion has allowed the accumulation of lethal mutations. The lethal mutations differ between *t* chromosomes and are not allelic[16,17]. The large number of *t*-lethal mutations is not unusual when it is considered that the *t*-inversions cover at least 15 megabases of DNA (H. Lehrach, personal communication) and even more mutations in this region have been obtained by saturation mutagenesis[18]. The *t* complex is an important system for studying segregation distortion and male fertility, but the genetics do not predict that the *t*-lethal mutations are related in any way or that they will, of necessity, define genes important in development. The potential interest of each *t*-lethal mutation must be considered separately.

Notwithstanding the demise of the *t* complex as the universal solution to genetic control of development, *T* is a good candidate for regulating mesoderm formation or interactions. Careful examination of *T*-mutant homozygous embryos indicates that mesoderm cells in the primitive streak behave aberrantly and that the notochord, a derivative of the mesoderm, fails to form correctly. Poor development of the allantois, another mesoderm derivative, is the cause of embryonic death. Shortening of the tail in heterozygotes is also the result of notochord defects stemming from abnormal associations between the notochord and other structures such as the gut and neural tube[3,4]. Herrmann *et al.*[7] exploited the existing genetic maps of the *t* region and a large number of cloned random sequences and genes to map sequences in the vicinity of the *T* gene. The sequences were used as probes to construct a long-range restriction map and to define large deletions and duplications known to include the *T* gene. By chromosome walking and jumping, the group isolated new sequences closer to the *T* gene. Finally, a potential HTF island (a CpG-rich region often associated with genes) was identified within a target region of 100 kilobases. The island was associated with a gene, *me75*, which is expressed specifically in mesoderm. Molecular analysis of *T* mutations is consistent with equivalence between *me75* and *T*. Particularly compelling is the analysis of T^{Wis}, a new spontaneous mutation of the *T* gene[18]. In T^{Wis}, the *me75* gene has suffered an insertion of a transposable element. Nevertheless, the authors rightly point out that final proof of identity between *me75* and *T* will require complementation studies in transgenic mice.

The cloned sequences are a starting point for direct determination of whether the *T* gene is important for regulating the development of mesoderm, or whether it is a bystander required only to meet a specific metabolic challenge. Unfortunately, the sequence of the *me75* gene provides no obvious clue to function, but the predicted protein sequence is not suggestive of a cell-surface molecule. A careful analysis of tissue-specific expression has been more fruitful. As would be expected of the *T* gene, expression of *me75* is restricted to primitive ectoderm (a mesoderm precursor), the mesoderm and the notochord — exactly those tissues known to be affected by mutant *T* genes.

Two fronts can be envisaged for future research. First, the production of antibodies and an investigation of the biochemical properties of the *me75* gene product. Second, genetic investigation of those genes known to modify the effects of the *T* mutations might define proteins that control *T*-gene expression or interact with the *T*-gene product. In addition to *tct*, which may be an allele at the *T* gene[19], there may be a further gene in the *t* region that affects *T* expression[20]. There is also[21] a modifier that is unlinked to *T*, as well as numerous mutations known to affect the notochord and tail. Many regard the mouse as the best model for studying human development; it would be ironic if the best developmental system in the mouse was its tail. □

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DAEDALUS

Sweating it out

A FRESHLY-MADE bed feels cool, not merely because its sheets are at room temperature, but because they are dry. Most bed-clothes are hygroscopic and absorb water vapour from the body, which is cooled accordingly. Once they have taken up all they can hold, the bed warms up. When the bed is aired, the water evaporates again.

So Daedalus is inventing bed-clothes and garments with controllable humidity. Intrepid DREADCO volunteers are wrestling with sheets loaded with silica gel, or donning underwear saturated with hydrated sodium carbonate, to judge the cooling or warming effect of a controlled dry or damp personal environment. Meanwhile, DREADCO's physicists are developing special water-pumping garments, by which the wearer can alter his personal humidity at will.

Their cunning new 'Watershed' fabric has porous, metallized electrode surfaces on each side. A voltage applied across the fabric impels its water content towards the positive side by electro-osmosis. This side therefore evolves water vapour, whereas the negative side absorbs it. Set to pump water vapour outwards, DREADCO's Watershed clothing will cool the wearer; set to pump it inwards, it will envelop him in a warming internal 'fug'.

To pump effectively against a reasonable vapour-pressure gradient, Watershed will need an electro-osmotic potential of several kilovolts. At first Daedalus feared that this would electrocute the wearer. But, in fact, a Watershed garment needs to pump so little water per unit area that it will only draw a tiny, almost electrostatic current. Its high voltage will then be hardly more inconvenient than that of a hastily donned nylon shirt. Indeed, Daedalus hopes to generate the required voltage from the wearer's own movements, through frictional charge-separation units in rubbed areas of the garments like sleeves or trouser legs. The wearer thus acts as his own thermostat. The more vigorously he exercises, the more strongly his Watershed clothing will cool him. In the cold he will reverse the polarity, when the more he shivers the faster it will warm him up. He will have full personal, automatic air-conditioning.

Profound social consequences will follow. The massive power drain of heating and air-conditioning will plummet: why cool a whole building when the inhabitants can cool themselves? Fashion designers will relish the new metallized high-tech fabric, until they realize with horror that it spells the end of fashion. For one single, universal Watershed overall will serve every need — study or vigorous exercise, indoors or outdoors or even in the wet. It can even pump out the rain to keep you dry and smart in the most drenching downpour. David Jones