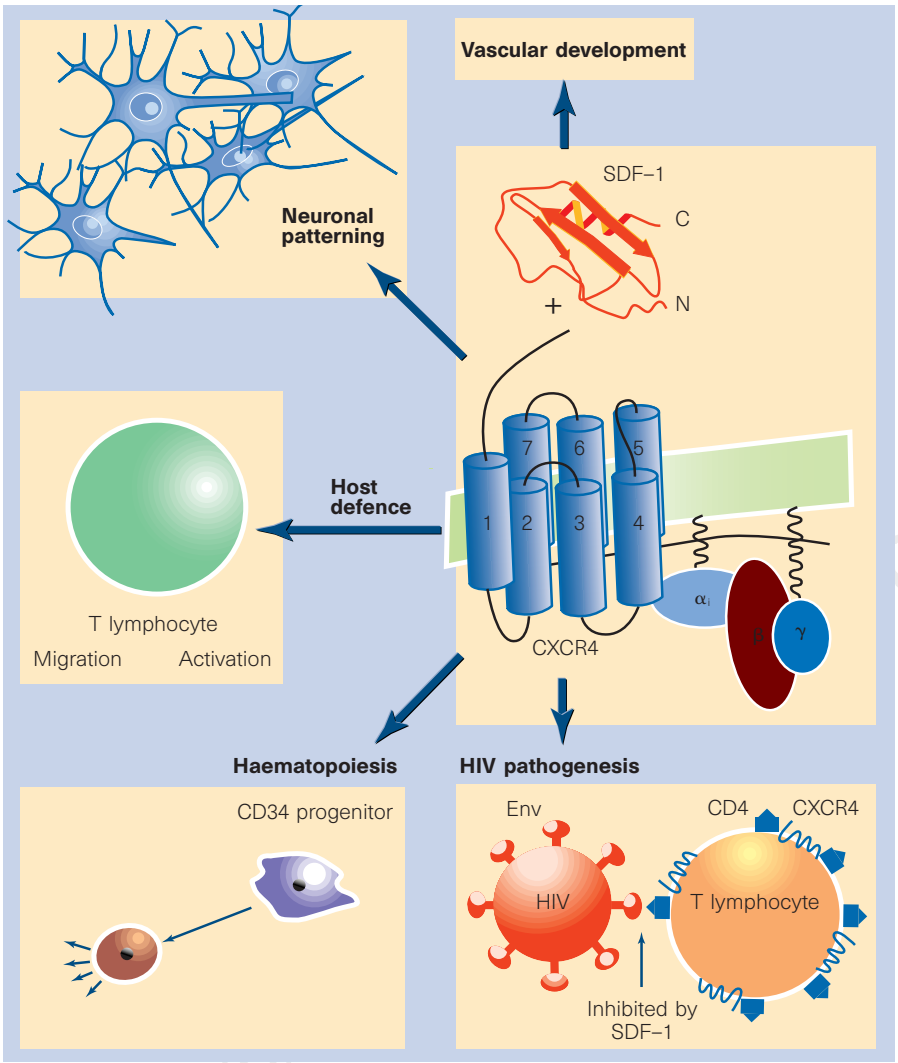

Figure 1 **Biological roles of the chemokine receptor CXCR4 and its ligand SDF-1. Tachibana *et al.*[3] and Zou *et al.*[4] have found that mice lacking CXCR4 have a similar phenotype to those lacking SDF-1 — namely, serious developmental defects in the immune and circulatory systems. Surprisingly, the mice also show defects in the central nervous system and in the formation of blood vessels within the gastrointestinal tract, indicating that chemokines have much more widespread functions than was initially thought.**

same family (interleukin-8 and melanoma growth-stimulatory activity, for example) are known to be potent angiogenic factors[11]. However, the physiological relevance of the angiogenic properties of these chemokines is still unclear, particularly as mice that lack the interleukin-8 receptor seem to have a normal vasculature[12].

The studies of Tachibana *et al.*[3] and Zou *et al.*[4] have revealed that CXCR4 is important in embryonic development, particularly in the formation of blood vessels in the gastrointestinal tract and in neuronal patterning within the CNS. The findings highlight new directions for chemokine research that biologists will need to consider, and they also make sense within the context of the biological properties of chemokines. As pointed out by Baggiolini[2], the chemoattractant properties of chemokines would be useful during morphogenesis to keep the cells that form tissues together. This is something that chemokines do very well and, as we have seen with the CXCR4- and SDF-1-knockout mice, there are quite dramatic developmental consequences when these proteins are deleted. □

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Daedalus

Human quality control

Human reproduction is a highly uncertain business. Even trying hard, a woman may take many months to achieve pregnancy. Of her ova that manage to get fertilized, about 70% are likely to be miscarried — mostly so rapidly that she notices nothing but a missed or delayed period.

This, says Daedalus, shows evolution at work. Stable creatures like cats and cows can reproduce easily and unfailingly; but human beings are a recent and hasty evolutionary lash-up. Like a new generation of microprocessors, they push the state of the art so far that 100% yields cannot be expected. Flawed specimens are inevitable, and must be identified by rigorous quality-control tests. They are rejected rapidly, allowing their owner to try again.

So DREADCO biochemists are seeking to understand the 'dialogue' of tests between mother and fetus. It may be a strategic contest, like many other inter-generational genetic struggles; or it may be entirely honest. A set of genes trapped in a sub-standard fetus may prefer to be aborted, to give an identical set a better chance next time. One clue is that many drugs — among them alcohol, nicotine, caffeine and aminopterin — increase the spontaneous abortion rate. The conventional wisdom is that they may damage the fetus, so that it fails the mother's quality-control tests. On the other hand, they may sabotage the tests themselves, and trigger rejection by giving falsely low readings. Daedalus muses that they may even raise the tests' acceptance threshold. Mediocre fetuses, which might otherwise have just scraped an undistinguished pass, are then rejected; only the best are retained to term.

With luck, DREADCO's biochemical investigations and epidemiological studies will soon elucidate the testing process. Presumably the mother challenges the fetus with a chemical signal; the fetus releases, or fails to release, a competent hormonal response; and a chemical 'reject' signal triggers spontaneous abortion.

When identified, the 'reject' signal will be the ideal, natural, abortifacient. It will not damage the mother — evolution will have seen to that. It will be the perfect morning-after (or even month-after) contraceptive. And if it works by raising the acceptance level to some lofty peak of human perfection, then its occasional failure may be no bad thing. The mother will know that she is carrying an exceptional baby, well worth the inconvenience.

David Jones