THIS MONTH IN NATURE BIOTECHNOLOGY

Phytoremediation blasts off

One of the more elusive goals of bioremediation has been finding organisms that can destroy the high levels of explosives found in soils around munitions sites. Certain microbes can denitrify nitrate explosives in the lab, but have failed to thrive on sites. To get around this problem, Bruce and colleagues transferred this degradative ability from microbe to plants, which are more easily harvested and sustained in the field (pp. 491 and 491). They engineered tobacco plants that express pentaerythritol tetranitrate reductase, a microbial enzyme capable of removing nitrates from TNT and GTN. The transgenic plants can withstand exposure to higher levels of explosives and break them down into harmless components.

Test run for kidney replacement

Hemodialysis makes use of an artificial kidney that removes excess water and toxic metabolites from the blood, but does nothing to replace the important absorptive, metabolic, endocrine, and immunological functions associated with the tissues of the natural organ. These functions are largely associated with the epithelial cells of the kidney tubules. In this issue, Humes and co-workers test their "bioartificial kidney," which actually incorporates live tubule cells into its design, reconstituting many of these lost functions (pp. 421 and 451).

Deoxyribozyme put to use

Targeting mRNA for inactivation is the goal of a number of therapeutic approaches. But a major hurdle in developing these reagents is the ability for RNA to form secondary structures—making much of a transcript inaccessible. Sun and colleagues tackle this problem by using deoxyribozymes in a multiplex screen to seek out and cleave the most accessible site in a transcript (pp. 422 and 480). Screening from more than 100 versions of the enzyme with different RNA-binding domains, they selected only a few that passed muster, and then went on to verify that the chosen few were also superior in vivo.

Research Briefs written by Natalie DeWitt and Robert Frederickson.

Cloning transgenic goats

In a span of roughly three years, somatic cell nuclear transfer has evolved from scientific novelty to an important commercial strategy for the generation of transgenic animals producing biopharmaceuticals. In this issue, Echelard and co-workers describe the transfer of this technology to the goat, an attractive transgenic bioreactor (p. 456). Using nuclei from fetal cells from a transgenic founder, they succeeded in producing clones that secreted human antithrombin III in their milk.

The eyes have it

On page 476, Roy et al. demonstrate that antisense oligos effectively reduce retinal gene expression in live animals. This group had previously shown that in endothelial cell culture, these same oligos reduce expression of fibronectin—which overgrows and blocks the retinal microvessels of diabetic patients. In this study, they coupled these oligos to a novel polymeric carrier and injected them into rat eyes, where they specifically reduced the amount of fibronectin in retinal microvessels.

Expression of foreign genes in yeast and cultured insect and mammalian cells is widely used for biopharmaceutical production and as a basic research tool. In this issue, Gaertig et al. describe an alternative expression system in the ciliate, *Tetrahymena thermophila* (pp. 424 and 462). Their system allows high-level expression of foreign antigens on the cell surface, and could even facilitate the development of live vaccines against certain pathogens.

Signal sequence trap

The signal sequence is a short hydrophobic peptide that targets both secreted and cell surface proteins to the plasma membrane. In this issue, Kitamura and co-workers have developed a cDNA cloning strategy that specifically isolates genes containing such sequences (p. 487). Their system exploits the ability of signal sequences to redirect a constitutively active cytokine receptor to the cell membrane, allowing selection of positive clones based on their ability to promote cell growth in the absence of the cytokine in the media.

Imagine a factory fueled by sunshine, where hydroponically grown transgenic plants secrete biopharmaceuticals from their roots into a buffer that flows directly into an on-line protein purification system. Raskin and colleagues (pp. 427 and 466) show that this scenario may not be as improbable as it sounds. They fused soluble proteins to endoplasmic reticulum-targeting signals and expressed the recombinant proteins in transgenic hydroponically grown tobacco. Then they let the plants' root systems do all the work, secreting high levels of active protein directly into the hydroponic media.

Tailoring viral tropism

The widespread distribution of the primary receptors for adenoviruses has limited their use for targeting therapeutic genes to specific cells in vivo. Getting around this problem requires not only that binding to the native receptor be abolished, but that alternate receptors be engineered to allow propagation of the modified virus in standard packaging lines. On page 470, Douglas et al. do just that, and open the door for the development of adenoviral vectors with single-cell specificity for gene therapy applications.

An anti-mitotic peptide

On page 495, Galvez and de Lumen report that a soybean peptide called lunasin inhibits mitosis in mammalian cells. Lunasin was initially found as a component of a cotyledon-specific protein implicated in inhibiting cell division during seed development. This report shows that when lunasin was cloned and expressed as a green fluorescent protein fusion in several mammalian cell lines, it inhibited mitosis by disrupting kinetochore function.