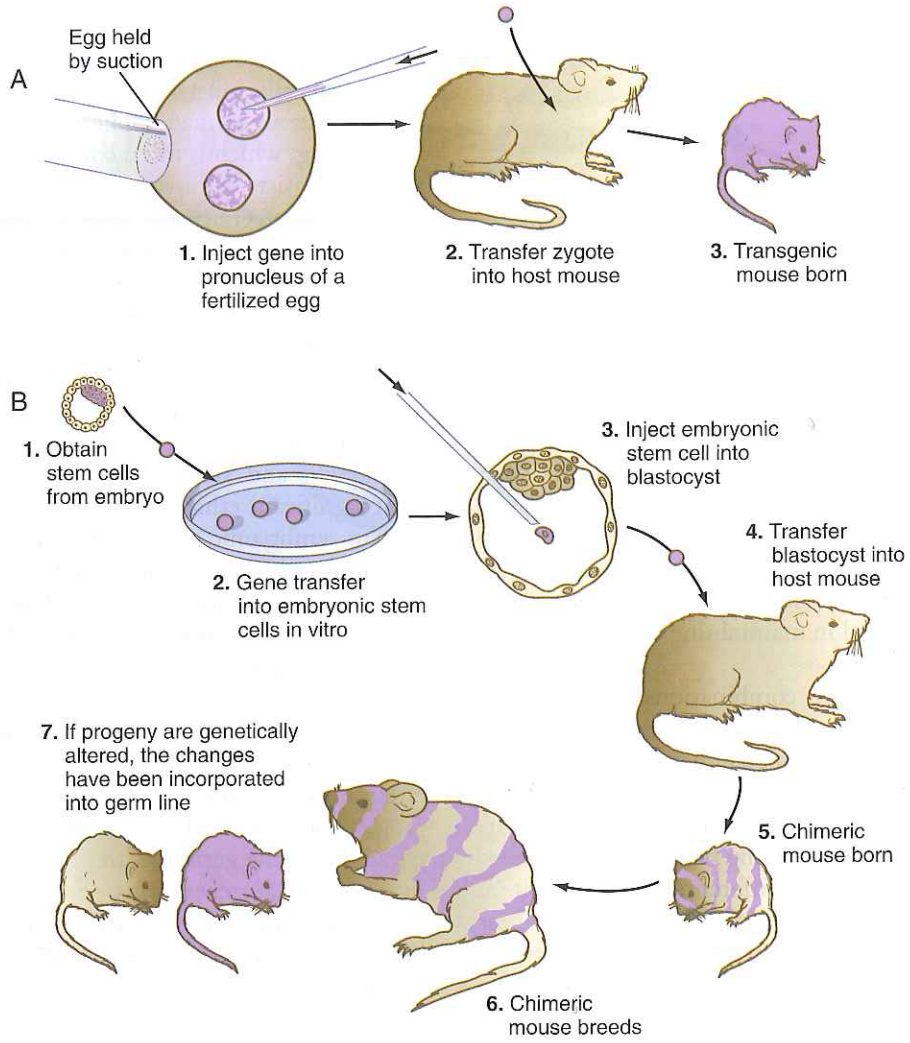

FIGURE 3-11. A, Procedure for creating transgenic mice by pronuclear injection. **B,** Procedure for inserting genes into mice by first introducing them into embryonic stem cells and then inserting the transfected stem cells into an otherwise normal blastocyst.

region (MT-I) into the pronuclei of mouse zygotes. The injected zygotes are transplanted into the uteri of foster mothers, which give birth to normal-looking transgenic mice. Later in life, when these transgenic mice are fed a diet rich in zinc, which stimulates the MT-I promoter region, the rat growth hormone gene is activated, causing the liver to produce large amounts of the polypeptide growth hormone. The function of the transplanted gene is obvious; under the influence of the rat growth hormone that they were producing, the transgenic mice grow to a much larger size than their normal littermates (Fig. 3-12). The technique of producing transgenic embryos is being increasingly used to examine factors regulating the expression of specific genes in embryos and to disrupt genes in the host embryos. In addition, the efficacy of this technique to correct known genetic defects is being increasingly explored in mice.

An important technological advance is the creation of lines of embryo-derived stem cells (**ES cells**). ES cells are originally derived from inner cell masses and can be propagated in vitro as lines of pluripotential cells that can be

FIGURE 3-12. Photograph of two 10-week-old mice. The one on the left (normal mouse) weighs 21.2 g. The one on the right (a transgenic littermate of the normal mouse) carries a rat gene coding for growth hormone. It weighs 41.2 g. (From Palmiter RD and others: Dramatic growth of mice that develop from eggs microinjected with metallothionein-growth hormone fusion genes, *Nature* 300:611-615, 1982.)