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PDGF INDUCES AGE- AND DOSE-DEPENDENT DIFFERENTIAL FIBROBLAST CHEMOTAXIS IN FETAL, NEONATAL, AND ADULT CELL LINES IN FETAL BOVINE SERUM

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FETAL WOUND HEALING is characterized by the regeneration of normal tissue without scar.[1] Fibroblast migration is an essential feature of wound healing. Platelet-derived growth factor (PDGF) is a potent chemoattractant to postnatal fibroblasts, but the effect on fetal fibroblasts has not been studied.[2] We postulate that fetal fibroblasts respond to PDGF differently than postnatal fibroblasts. In order to evaluate the chemotactic response of human fetal fibroblasts to PDGF compared to neonatal and adult fibroblasts in the presence of fetal bovine serum (FBS), we performed a series of experiments in modified Boyden chambers.

MATERIALS AND METHODS

Cultured human dermal fibroblasts from a 12-week gestation fetus, neonatal foreskin, and a 66-year-old in their 5th to 16th passage were placed in the upper well (3×10^5) of modified Boyden chambers. Assays were run in triplicate using serum-free minimum essential medium (MEM) and MEM with 10% FBS to which PDGF (0, 0.01, 0.1, 1, and 10 U/mL) was added. After a 4-hour incubation, the 12-μm-pore polycarbonate filters, which separated the cells from the chemoattractants, were fixed and stained using a modified Wright–Geimsa stain. Chemotaxis was assessed by counting 20 oil immersion fields (1,000×). The unpaired Student's *t*-test was used for statistical analysis.

RESULTS

In serum-free media, PDGF inhibited fetal, neonatal, and adult fibroblast migration at 0.01 and 0.1 U/mL ($P < 0.006$) but caused an increase in migration at 1 U/mL ($P < 0.0001$) (Fig 1). In the presence of FBS, PDGF caused an age-dependent increase in migration in all fibroblasts (adult >>> neonatal >> fetal) ($P < 0.0001$) (Fig 2).

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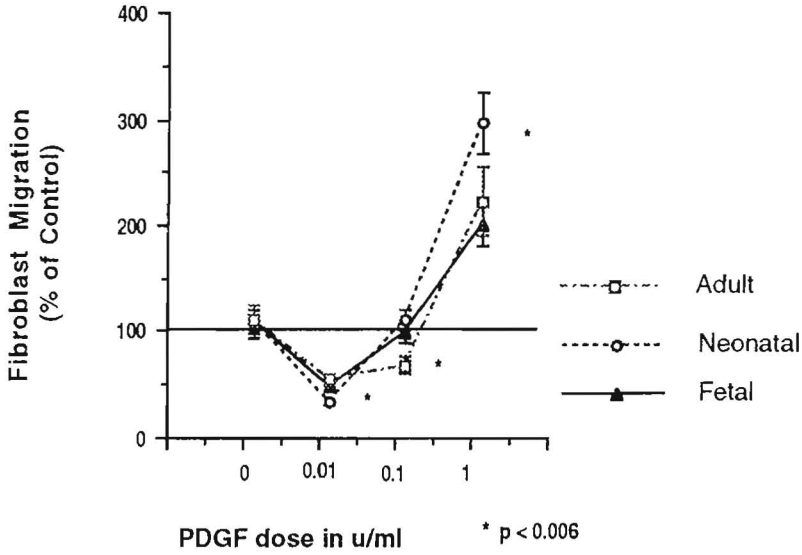

Fig 1—Chemotactic response of fetal, neonatal, and adult fibroblasts to PDGF in serum-free media. Fibroblast migration is shown as percentage of control (100% = no PDGF).

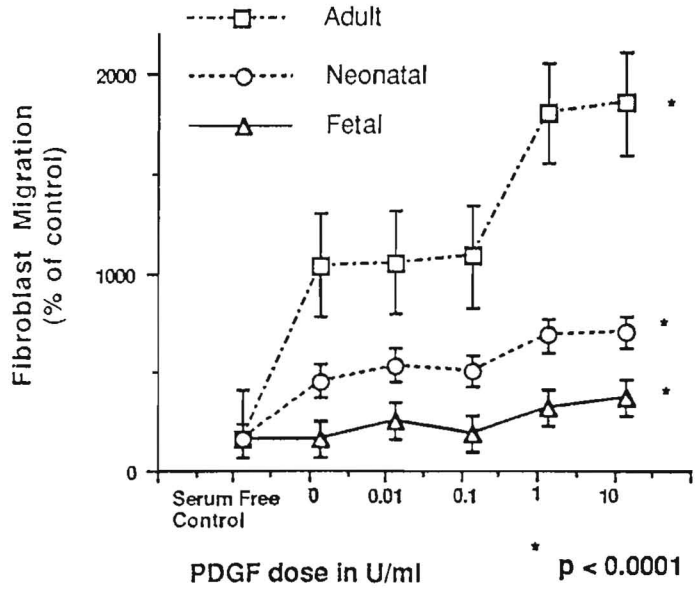

Fig 2—Chemotactic response of fetal, neonatal, and adult fibroblasts to PDGF and FBS. Fibroblast migration is shown as percentage of control (100% = no PDGF and serum-free media).

CONCLUSIONS

Fetal fibroblasts respond differently than postnatal fibroblasts to PDGF in the presence of FBS. PDGF causes an age- and dose-dependent increase in migration in the presence of FBS. The observed differences between fetal and postnatal fibroblast migration parallel differences in scar formation in fetal and postnatal wounds.

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