Synopsis of Original Research Paper

Molecular cloning of human hair follicle specific peptidylarginine deiminase cDNA and its function of hair regeneration

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Peptidylarginine deiminase (PAD) catalyzes the post-translational modification of proteins through the conversion of arginine to citrulline in the presence of calcium ions.

In rodents, PAD has been classified into four isoforms, types I, II, III, and IV, which are distinct in their molecular weights, substrate specificities, and tissue localization. Of these isoforms, only type III was detected in epidermis and hair follicles. Although the role of this enzyme in these tissues is not yet clear, indirect data have shown that several structural proteins such as filaggrin, trichohyalin, and keratin are substrates for PAD. In this study, we cloned the full-length cDNA of human PAD type III (3,142 bp) from cultured human keratinocytes by the reverse transcription-polymerase chain reaction and by rapid amplification of cDNA ends methods. This cDNA contained a 1,995 bp open reading frame encoding 664 amino acids (Mr = 74,770). To explore the physicochemical and enzymatic properties of human PAD type III, we constructed a plasmid for producing a recombinant human PAD type III in bacteria. The enzymatic characteristics of the recombinant enzyme were very similar to those of the rodent PAD type III. Based on the enzyme's activity towards human filaggrin and trichohyalin, it appears that the enzyme prefers catalyzing the modification of arginine residues in filaggrin. These data imply that human PAD type III may function as a modulator of filaggrin in these tissues.