Two Rare Mixed Heterozygotes for the Fluoride Variant and Silent Cholinesterases

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Serum cholinesterase (acetylcholine acyl-hydrolase, EC 3.1.1.8) breaks down the muscle relaxant, succinylcholine. The usual (E₄⁺), dibucaine variant (E₄⁺), fluoride variant (E₁⁺), and silent (E₁⁻) genes function as alleles at the E₄ locus and control the type of cholinesterase present. Kalow and Staron have described the dibucaine variant gene; Harris and Whittaker, the fluoride variant gene; Liddell et al., the silent gene. Individuals with the E₄⁺, E₁⁺, and E₁⁻ genes are at risk when exposed to succinylcholine.

Whittaker made the first identification of the mixed heterozygote for the fluoride variant and the silent cholinesterases (genotype E₁⁺E₁⁻) in the course of a family study. Simpson made the second identification of this rare genotype in a 40-year-old Caucasian woman who had 20 minutes' apnea after 30 mg of succinylcholine. The present family study was made because the propositus was markedly sensitive to succinylcholine.

METHODS

The propositus was a 4-year-old Caucasian boy. He received 40 mg of succinylcholine intramuscularly at 9:35 AM and was apneic until 11:45 AM. Respiratory assistance was needed until 12:15 PM, at which time respiration reverted to normal. Sera were collected from the patient and members of his family and stored at -20 C until needed.

RESULTS AND DISCUSSION

Table 1 gives the results of the family study. Serum cholinesterase activities were expressed as μmol of benzoylcholine hydrolyzed per min per ml of serum. Dibucaine, fluoride, Ro 2-0683, and Sernylan numbers refer to percentage inhibition of benzoylcholine hydrolysis in the presence of the inhibitor.

On the basis of the inhibition studies, the mother was genotype E₁⁺E₁⁻; the propositus could be E₁⁺E₁⁻ or E₁⁻E₁⁻; the paternal grand-

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†Sernylan and Ro 2-0683 were donated by their manufacturers.
TABLE 1. Activities and Inhibition Numbers

<table>
<thead>
<tr>
<th>Family Member</th>
<th>Activity</th>
<th>Dibucaine Number</th>
<th>Fluoride Number</th>
<th>Ro 2-0683 Number</th>
<th>Sermylan Number</th>
<th>Genotype</th>
</tr>
</thead>
</table>
| Paternal grandfather   | 0.898    | 65               | 44              | 89               | 69              | E₁⁺E₁⁻⁺⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻⁻ßenßen


