QUESTION: Succinate dehydrogenase (sdh) catalyzes the conversion of succinate to fumarate under aerobic conditions. Fumarate reductase (fdr) catalyzes the conversion of fumarate to succinate under anaerobic conditions.

Mutants defective for succinate dehydrogenase are unable to use succinate as a carbon source. It is possible to isolate suppressors of a sdh mutant that allow growth on succinate as a carbon source aerobically. List 6 different types of suppressors that might be obtained and describe how each suppressor would restore the sdh+ phenotype.

ANSWER: Some examples include the following:

(i) Informational suppressor -- e.g. a missense suppressor tRNA which would occasionally misread the sdh mRNA and produce a functional protein. [Note that if you begin with one mutation, it is unlikely that you will find multiple classes of tRNA suppressors.]

(ii) An allele specific, intragenic interaction suppressor with a mutation at a second site in the sdh gene that restores the structure and function of the Sdh protein.

(iii) A non-allele specific, intragenic suppressor with a mutation at a second site in the sdh gene that increases the stability or activity of the Sdh protein.

(iv) An allele specific, interaction suppressor in another protein that interacts with the Sdh protein that restores the structure and function of the Sdh protein.

(v) A bypass suppressor -- e.g. a mutation that allows the fdh gene product to catalyze the synthesis of succinate under aerobic conditions. [Such mutations were actually found using this approach.]

(vi) An overexpression suppressor that increases the amount of the mutant Sdh protein to sufficient levels that it allows cell growth.

(vii) A true revertant that restores the wild-type sdh DNA sequence.