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(54) Title: DE NOVO DESIGNED LUCIFERASE

(57) Abstract: Proteins having luciferase activity are disclosed, having the secondary structure arrangement H1-L1-H2-L2-E1-L3-E2-L4-H3-L5-E3-L6-E4-L7-E5-L8-E6, wherein "H" is a helical domain, "L" is a loop domain, and "E" is a beta strand domain; wherein: (a) the H1 domain is at least 18 or 19 amino acids in length; residue 14 of the H1 domain is Y, D, or E, and residue 18 of the H1 domain is D or E; (b) the E3 domain is at least 6, 7, 8, 9, or 10 amino acids in length and residue 2 of the E3 domain is R; and (c) the E5 domain is at least 10, 11, 12, 13, or 14 amino acids in length and residue 9 of the E5 domain is H or M.

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