

Table 1. Representative mutations and substitutions associated with azole resistance in *A. fumigatus*

| Environmental route | | | |
|-------------------------|-------------------|-------------------------|----------|
| Gene | Tandem repeats | Amino acid substitution | Ref. |
| <i>cyp51A</i> | — | G54E, A, or R | (47–50) |
| | TR ₃₄ | L98H | (44) |
| | TR ₃₄ | L98H/S297T/F495I | (46) |
| | TR ₄₆ | Y121F/T289A | (45) |
| | TR ₄₆ | Y121F/M172I/T289A/G448S | (38) |
| | TR ₅₃ | — | (43) |
| De novo (patient) route | | | |
| Gene | Tandem repeats | Amino acid substitution | Ref. |
| <i>cyp51A</i> | — | G54E, V, or R | (19, 31) |
| | — | G138C | (28) |
| | — | H147Y | (23) |
| | — | P216L | (23) |
| | — | M220K, or T | (23) |
| | — | H285Y | (7) |
| | — | Y431C | (23) |
| | — | G432S | (8) |
| | — | G434C | (23) |
| | — | G448S | (23) |
| | TR ₁₂₀ | | (37) |
| <i>hapE</i> | — | P88L | (35) |
| <i>hmg1</i> | — | S269F | (36) |
| <i>mdr1</i> | — | —† | (33) |
| <i>mdr2</i> | — | —† | (33) |
| <i>mdr3</i> | — | —† | (34) |
| <i>mdr4</i> | — | —† | (34) |

†These genes were overexpressed.