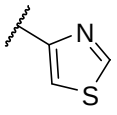
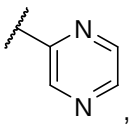
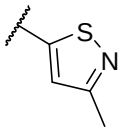
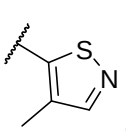
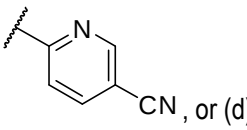
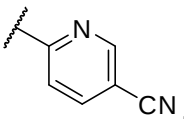

or (b) R^2 is F, Y is CH_2, n is 1, and R^3 is , or (c) R^2 is H, Y is a bond, n is 1, and R^3 is ,

, , or , or (d) R^2 is H, Y is a bond, n is 2, and R^3 is ,

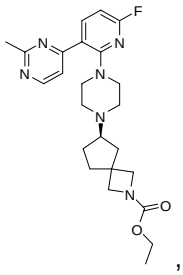
then R^5 is not $CO_2CH_2CH_3$ or $CO_2CH(CH_3)_3$. In some embodiments, one or more H, including but not limited to those present in any R^1, R^2, R^3, and/or R^4 groups, can be replaced with a D.

[0005a] Also provided herein are compounds, or pharmaceutically acceptable salts thereof, as recited in Table A.

[0005b] Also provided herein are pharmaceutical formulations comprising a therapeutically effective amount of the compound or salt as disclosed herein, and a pharmaceutically acceptable excipient.

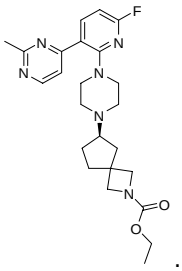
[0006] Further provided herein are pharmaceutical compositions comprising the compounds as disclosed herein. Also provided are methods of treating an M4-mediated (or M4-associated) disease or disorder associated with aberrant M4 receptor activity in a subject, comprising administering to the subject a therapeutically effective amount of a compound as disclosed herein.

[0006a] Further provided herein is a compound having the structure:

,

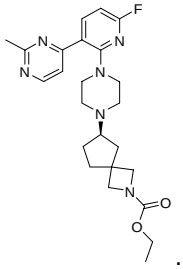
or a pharmaceutically acceptable salt thereof.

[0006b] Further provided herein is a compound having the structure:



.

[0006c] Further provided herein is a pharmaceutically acceptable salt of a compound having the structure:

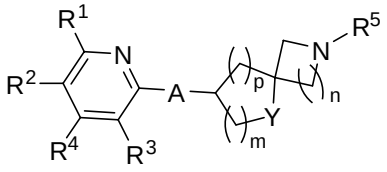


.

[0007] Further aspects and advantages will be apparent to those of ordinary skill in the art from a review of the following detailed description, taken in conjunction with the drawings. While the compounds and methods disclosed herein are susceptible of cases in various forms, the description hereafter includes specific cases with the understanding that the disclosure is illustrative, and is not intended to limit the invention to the specific cases described herein.

DETAILED DESCRIPTION

[0008] Provided herein are compounds that have a structure of Formula (I):



(I), or a pharmaceutically acceptable salt thereof. Also provided herein are compounds that act on M4 receptors. The compounds described herein can be used to treat M4-mediated or M4-associated diseases.