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Regioselective Base-Mediated Cyclizations of Mono-*N*-acylpropargylguanidines

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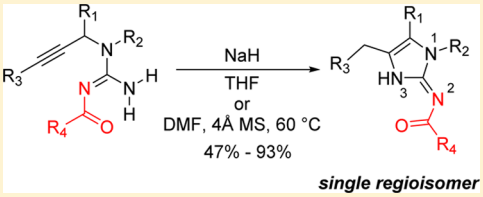
Supporting Information

ABSTRACT: A regioselective base-mediated cyclization of mono-*N*-acylpropargylguanidines is reported. A related Ag(I)-catalyzed hydroamination strategy was recently employed to yield N^3-Cbz-protected ene-guanidines, which found utility in the synthesis of naamidine A. Herein, we report the base-catalyzed hydroamination of mono-*N*-acylpropargylguanidines, which proceeds with the opposite regiochemistry to deliver isomerized N^2-acyl-2-aminoimidazoles with broad substrate scope, circumventing the problematic regiospecific acylation of free 2-aminoimidazoles.



The abundance of 2-aminoimidazoles in marine natural product cores has motivated the development of a methodology to access these nitrogen-rich heterocycles with robust chemistry.[1] Tailoring of the heterocycle to the 2-monoacylaminoimidazole scaffold has yielded a class of pharmacologically privileged compounds that include transforming growth factor β1 receptor (TGFβ1) inhibitors,[2] glial inflammation suppressors,[3] antihepatitis C agents,[4] and Pgp-multidrug resistance reversal agents.[5]

We were particularly inspired by the unique EGF-dependent cytotoxicological profile of naamidine A, a 2-aminoimidazole alkaloid originally isolated from the marine sponge *Leucetta chagosensis*, and its applications in breast cancer therapy.[6,7] Extending our methodology for the synthesis of naamidine A, we reported a number of first generation analogues.[8] Initial screening of these compounds identified a compound dubbed zinaamidole A (ZNA, **4a**) as a promising lead due to its antiproliferative activity (EC_{50} = 8.8 μM) against drug-resistant pleural effusion cells (PE1005339) derived from patients with breast cancer as well as immortalized, cancerous MCF-7 cells (EC_{50} = 3.3 μM).[9] In additional assays, ZNA showed negligible cytotoxicity against normal primary epithelial cells or the untransformed breast cancer cell line MCF-10A and was significantly more selective than its natural product inspiration naamidine A.[10,11] This selectivity of growth inhibition against cancerous tissue necessitated efforts toward a scalable, modular synthesis of ZNA and structurally related compounds.

Initial efforts to generate simplified naamidine A analogues focused on the treatment of a free 2-aminoimidazole with an acid chloride, yielding a problematic 1:2 mixture of mono and bis-N^2-acylated products, respectively; a similar phenomenon was reported by Jiang and co-workers.[7] Our solution relied on treatment of mono-Cbz-protected propargylguanidines with $AgNO_3$, yielding a N^3-Cbz-ene-guanidine bearing an exocyclic alkene as a single regioisomer.[8] This allowed for the selective acylation of N^2, followed by Cbz deprotection of N^3 to yield N^2-acyl-2-aminoimidazoles such as ZNA. We reasoned that deprotonation of the mono-*N*-acylpropargylguanidine might allow for preferential cyclization through the more reactive, nonacylated guanidine nitrogen to directly give N^2-acyl-2-aminoimidazoles without the need for this protection/deprotection sequence. Examples of diverse metal-catalyzed and base-mediated hydroaminations exist in the literature,[12,13] including the synthesis of imidazole-2-thiones from propargylthioureas;[14] however, the reactivity and regioselectivity of mono-*N*-acylpropargylguanidine hydroaminations have not been explored. If this reactivity were realized, it would greatly facilitate the preparation of ZNA analogues for biological evaluation.

To evaluate this hypothesis, we treated propargylamine **1a** with potassium *N*-cyano-2-fluorobenzamide **2a** activated by TMSCl to deliver mono-*N*-acylpropargylguanidine **3a** (Scheme 1). To our delight, the addition of 1 equivalent of NaH to compound **3a** in THF afforded a material that was identical to ZNA, indicating that not only had the cyclization occurred exclusively through the nonacylated nitrogen but subsequent double bond isomerization directly yielded the N^2-acyl-2-aminoimidazole. These results were confirmed by spectroscopic methods and permitted the multigram synthesis of ZNA in four transformations. The crystal structure of **4a** has been reported previously.[8]

Further exploration of the efficiency and selectivity of this transformation began with the preparation of mono-*N*-acylpropargylguanidines from potassium salts of *N*-cyanobenzamides activated by TMSCl and respective secondary propargylic amines (Table 1). All of the reactions performed proceeded in good yields at room temperature, usually reaching completion within 20 min. Generally, more electron-deficient *N*-cyanobenzamides performed better in the guanidinylation step, presumably due to the increased reactivity of their *N*-silylcarbodiimide intermediates. Initial investigation into the scope of the NaH-mediated hydroamination of mono-*N*-

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Scheme 1. Second Generation Synthesis of ZNA

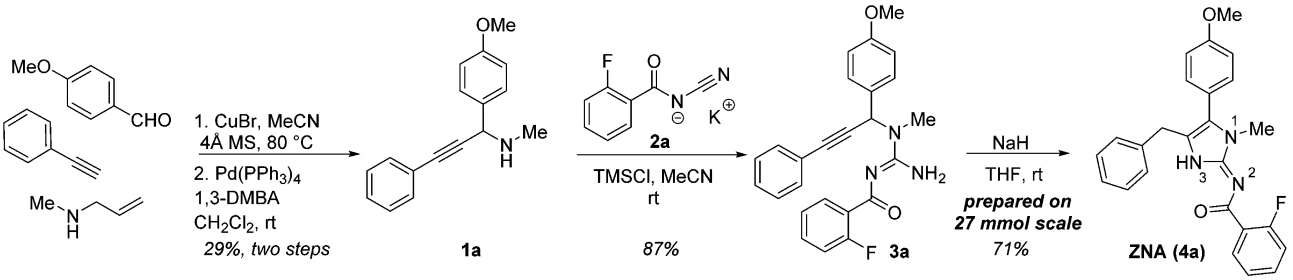
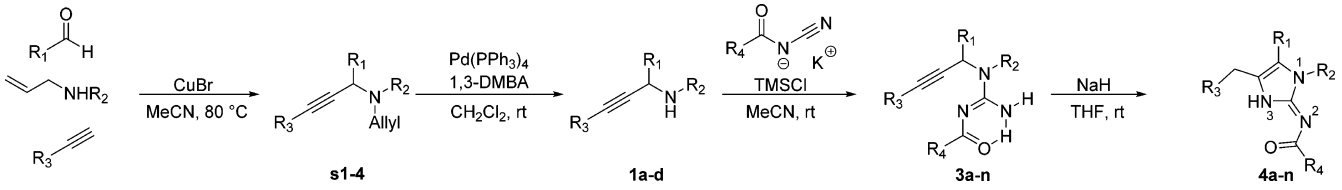
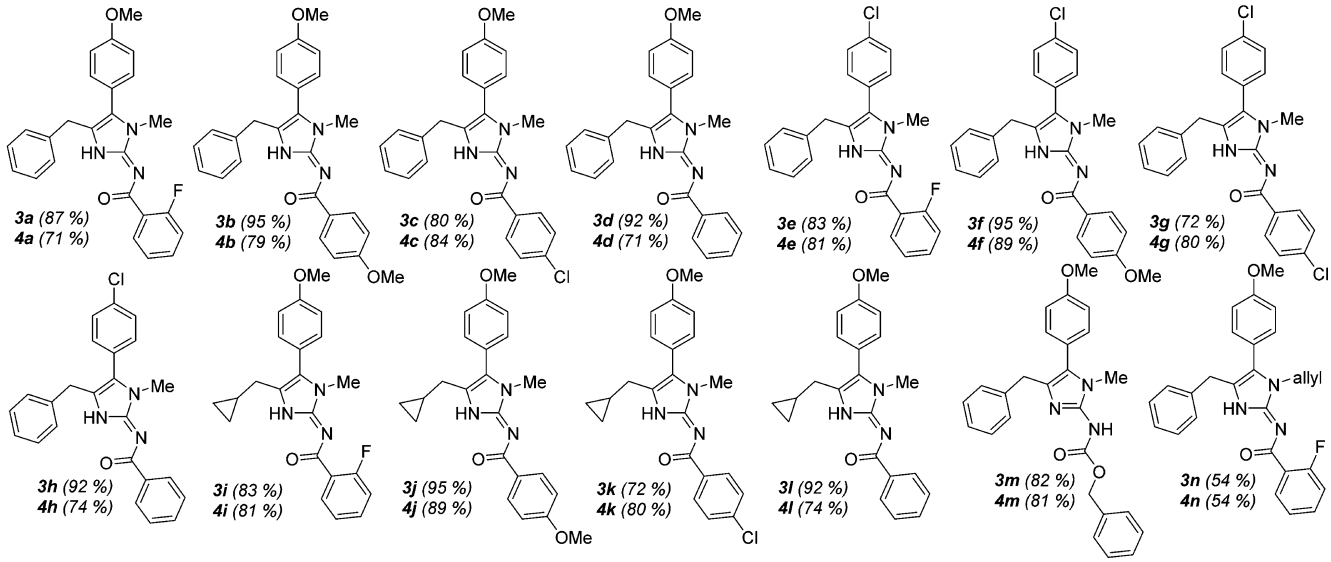


Table 1. Substrate Scope of the Synthesis of N^2-Acyl-2-aminoimidazoles



Examples:



acylpropargylguanidines revealed that the reaction is amenable to electron-donating and -withdrawing aryl substituents at the R^1 and R^4 positions. Introduction of a cyclopropyl group at the R^3 position gave comparable yields to those of aryl substituents (e.g., **4i**–**4l**). Carbamoyl guanidines also cyclize selectively under these conditions as illustrated by **4m**. The regiochemistry is further supported by the X-ray structure of **4m** (Figure 1). Interestingly, this N^2-carbamoyl derivative exists as the endocyclic N^3-imino tautomer in contrast to structures of the amides at N^2 previously obtained in our laboratory, which exist predominantly as exocyclic N^2-imino tautomers.

Cyclization of substrates in which the R^1 position was unsubstituted or alkyl-substituted failed to undergo cyclization with our initial conditions. This was surprising, as we have never observed a reaction dependence on this substituent in the metal-catalyzed cyclizations (Ag^I or Rh^{II}).[13] For example, when we attempted the cyclization of **3p** (R^1 = iPr) under the same conditions as the aryl-substituted propargylguanidines in Table 1, we observed only starting material accompanied by decomposition products, as evidenced by NMR spectroscopy of the crude material (Table 2).

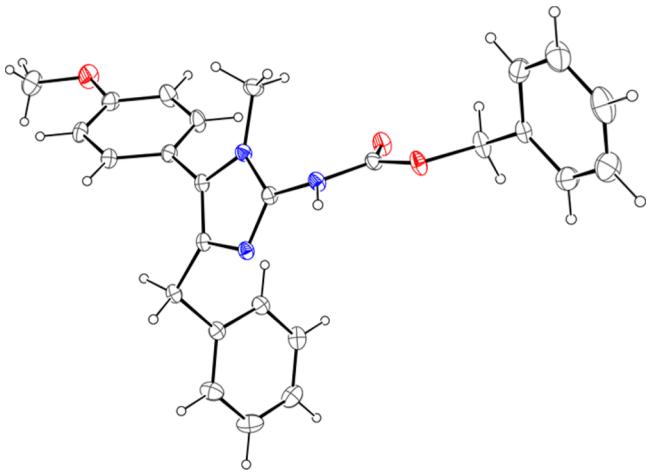


Figure 1. Crystal structure of **4m** (ellipsoids are shown at 35% probability level).

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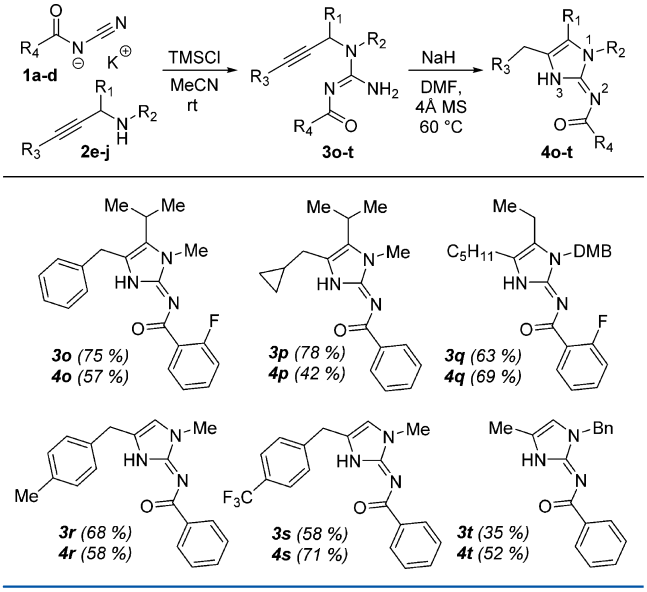
Table 2. Optimized Conditions for Synthesis C^5-Alkyl and C^5-Unsubstituted 2-Acylaminoimidazoles from Mono-*N*-acylpropargylguanidines



After optimization of this reaction, it was found that treatment of **3p** with NaH in DMF at 60 °C with molecular sieves proceeded cleanly to give the desired N^2-acyl-2-aminoimidazole with minimal byproducts as judged by ^{1}H-NMR. It appears that the intermediate cyclic ene-guanidine is prone to decomposition if strict anhydrous conditions are not maintained. Because the isomerization of the cyclic ene-guanidine to the N^2-acyl-2-aminoimidazole is facilitated by the aromatic group at R^1, we presume that the increased lifetime of the cyclic ene-guanidine when R^1 = alkyl leads to decomposition and lowers the efficiency of the transformation in those substrates. Under these optimized conditions, a variety of alkyl-substituted substrates can be cyclized, including the dialkyl substrate **3q** to give **4q** and the unsubstituted substrates **3r–t** to give **4r–t**.

In summary, we have reported a synthetically useful and broadly applicable means of generating N^2-acyl-2-acylaminoimidazoles with high regiochemical fidelity through the base-mediated hydroamination of mono-*N*-acylpropargylguanidines. This provides a robust 4-step synthesis of highly substituted N^2-acyl-2-aminoimidazoles from commercially available starting materials, in contrast to the lengthy methods used in other procedures, and avoids the use of a protecting group strategy when furnishing the N^2-acyl-2-acylaminoimidazoles.

EXPERIMENTAL SECTION

General Experimental Considerations. Unless otherwise noted, all starting materials were either known compounds or were obtained from commercial sources and used without purification. All reactions requiring anhydrous conditions were performed under a positive pressure of nitrogen using flame-dried glassware. Silver nitrate was purchased from Sigma-Aldrich. Dichloromethane (CH_2Cl_2), acetonitrile (CH_3CN), tetrahydrofuran (C_4H_8O), dimethylformamide (C_3H_7NO), and diethyl ether (Et_2O) were degassed with argon and passed through a solvent purification system (J.C. Meyer of Glass Contour) containing either alumina or molecular sieves. Flash chromatography was performed on Merk silica gel Kieselgel 60 (230–400 mesh) from EM science with the indicated solvent. ^{1}H NMR spectra were recorded on Varian Unity-300, Inova-400, or VXR-500 MHz spectrometers as indicated. The chemical shifts (δ) of proton resonances are reported relative to $CDCl_3$ or CD_3OD, using the following format: chemical shift [multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, app = apparent, br = broad), coupling constant(s) (J in Hz), integral].[15,16] ^{13}C NMR spectra were recorded at 75, 100, or 125 MHz. The chemical shifts of carbon resonances are reported relative to the deuterated solvent peak. Mass spectra were obtained at the University of Utah CIF on an LCT XE premier (ESI/APCI-TOF) for HRMS.

General Procedure for the 3-Component Coupling. *N-(1-(4-Methoxyphenyl)-3-phenylprop-2-yn-1-yl)-N-methylprop-2-en-1-amine (**s1**).* In a 250 mL high-pressure flask containing a magnetic stir bar were added *p*-anisaldehyde (10 g, 73.4 mmol), phenylacetylene (7.5 g, 73.4 mmol), *N*-allylmethylamine (4.75 g, 66.7 mmol), oven-dried molecular sieves (Grade 564, 3 Å, 8–12 mesh) (~2 g), and acetonitrile (200 mL). The flask was sealed and placed in a preheated 80 °C oil bath for 24 h. The reaction flask was removed from the oil bath and allowed to cool to room temperature. CuBr (0.95 g, 6.67 mmol) was then added, and the flask was sealed and returned to the preheated 80 °C oil bath for 48 h. The reaction tube was removed from the oil bath and allowed to cool to room temperature. The mixture was filtered through diatomaceous earth and rinsed with EtOAc (50 mL). The filtrate was concentrated under reduced pressure. The crude product was purified via flash chromatography, eluting with 9:1 hexanes/EtOAc to give a dark orange oil (12.7 g, 65%). R_f = 0.78 (2:1 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.59–7.53 (m, 4H), 7.37–7.26 (m, 3H), 6.49 (d, J = 8.7 Hz, 2H), 5.92 (ddt, J = 6.6 Hz, 10.5 Hz, 17.4 Hz, 1H), 5.33 (dd, J = 17.4 Hz, 2.0 Hz, 1H), 5.19 (dd, J = 9.3 Hz, 2.0 Hz, 1H), 4.94 (s, 1H), 3.83 (s, 3H), 3.19 (d, J = 6.6 Hz, 2H), 2.24 (s, 3H). ^{13}C NMR ($CDCl_3$, 75 MHz): δ 159.1, 136.3, 131.9, 131.1, 129.7, 128.4, 128.2, 123.4, 117.7, 113.6, 88.3, 85.3, 59.3, 57.8, 55.4, 37.8 ppm. IR (thin film): 2948, 2834, 2786, 1642, 1609, 1583, 1507, 1488, 1441, 1301, 1244, 1169, 1126, 1107, 1033, 994, 962, 916, 850, 807, 778, 754, 689, 583, 524 cm^{-1}. HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{20}H_{21}NO$, 292.1701; found, 292.1699.

*N-(1-(4-Chlorophenyl)-3-phenylprop-2-yn-1-yl)-N-methylprop-2-en-1-amine (**s2**).* Prepared from the 3-component coupling of 4-chlorobenzaldehyde (5 g, 35.57 mmol), phenylacetylene (3.9 mL, 35.57 mmol), *N*-allylmethylamine (3.07 mL, 32.34 mmol), oven-dried molecular sieves (Grade 564, 3 Å, 8–12 mesh) (~2 g), and acetonitrile (200 mL) with flash chromatography purification using silica gel eluting with 9:1 hexanes/EtOAc to yield a dark orange oil (5.84 g, 61%). R_f = 0.75 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.65–7.61 (m, 2H), 7.59–7.56 (m, 2H), 7.40–7.34 (m, 5H), 5.90–5.91 (m, 1H), 5.35 (dd, J = 17.0 Hz, 2.0 Hz, 1H), 5.23 (dd, J = 10.5 Hz, 2.0 Hz, 1H), 4.98 (s, 1H), 3.21 (d, J = 6.0 Hz, 2H), 2.26 (s, 3H). ^{13}C NMR ($CDCl_3$, 125 MHz): δ 137.5, 135.9, 133.3, 131.8, 129.8, 128.4, 128.3 (2), 122.9, 117.9, 88.7, 84.2, 59.1, 57.8, 37.6 ppm. IR (thin film): 1487, 1442, 1402, 1089, 1014, 994, 962, 920, 853, 796, 689, 592, 582 cm^{-1}. HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{19}H_{19}NCl$, 296.1026; found, 296.1206.

*N-(3-Cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylprop-2-en-1-amine (**s3**).* Prepared from the 3-component coupling of *p*-anisaldehyde (500 mg, 4.12 mmol), cyclopropylacetylene (0.35 mL, 4.12 mmol), *N*-allylmethylamine (0.36 mL, 0.38 mmol), oven-dried molecular sieves (Grade 564, 3 Å, 8–12 mesh) (~2 g), CuBr (0.46 g, 3.23 mmol), and acetonitrile (100 mL) with flash chromatography purification using silica gel eluting with 9:1 hexanes/EtOAc to yield a dark orange oil (226 mg, 22%). R_f = 0.68 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.43 (d, J = 8.5 Hz, 2H), 6.86 (d, J = 8.5 Hz, 2H), 5.84–5.81 (m, 1H), 5.23 (dd, J = 17.0 Hz, 1.5 Hz, 1H), 5.12 (d, J = 6.5 Hz, 1H), 4.62 (s, 1H), 3.04 (t, J = 7.5 Hz, 2H), 2.10 (s, 3H), 1.40–1.32 (m, 1H), 0.84–0.80 (m, 2H), 0.75–0.71 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 159.1, 136.6, 131.7, 129.7, 117.5, 113.5, 91.7, 77.5, 59.0, 57.7, 55.5, 37.8, 8.8, 0.2 ppm. IR (thin film): 1610, 1507, 1361, 1243, 1109, 1035, 1016, 999, 918, 982, 850, 808, 777, 584 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{17}H_{22}NO$, 256.1701; found, 256.1701.

*N-Allyl-N-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)prop-2-en-1-amine (**s4**).* Prepared from the 3-component coupling of *p*-

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anisaldehyde (4.0 mL, 33 mmol), phenylacetylene (3.55 mL, 33 mmol), *n*-diallylamine (3.7 mL, 30 mmol), CuBr (430 mg, 3 mmol), oven-dried molecular sieves (Grade 564, 3 Å, 8−12 mesh) (~1 g), and acetonitrile (100 mL) with flash chromatography purification using silica gel eluting with 9:1 hexanes/EtOAc to yield a light yellow oil (3.55 g, 38%). R_f = 0.75 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.59 (d, J = 8.5 Hz, 2H), 7.55−7.54 (m, 2H), 7.53−7.51 (m, 3H), 6.89 (d, J = 8.5 Hz, 2H), 5.90−5.83 (m, 1H), 5.27 (d, J = 17.0 Hz, 1H), 5.14 (d, J = 10.0 Hz, 1H), 5.05 (s, 1H), 3.82 (s, 3H), 3.28 (dd, J = 14.0 Hz, 2.0 Hz, 2H), 3.04 (dd, J = 14.0 Hz, 8.0 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 159.1, 136.8, 132.1, 132.0, 131.6, 129.6, 128.5, 128.3, 123.6, 117.5, 113.7, 88.9, 85.9, 56.2, 55.5, 53.7 ppm. IR (thin film): 1609, 1508, 1489, 1447, 1301, 1246, 1170, 1108, 1036, 995, 971, 919, 848, 811, 759, 691 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{22}H_{24}NO$, 318.1858; found, 318.1867.

N-Allyl-1-cyclopropyl-N,4-dimethylpent-1-yn-3-amine (**s5**). Prepared from the 3-component coupling of isobutyraldehyde, cyclopropylacetylene, and *n*-allylmethylamine.[17]

N-Allyl-N,4-dimethyl-1-phenylpent-1-yn-3-amine (**s6**). Prepared from the 3-component coupling of isobutyraldehyde, phenylacetylene, *n*-allylmethylamine, CuBr, oven-dried molecular sieves (Grade 564, 3 Å, 8−12 mesh) (~1 g), and acetonitrile (100 mL) with flash chromatography purification using silica gel eluting with 9:1 hexanes/EtOAc to yield a light yellow oil (3.5 g, 46%). R_f = 0.74 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.47−7.44 (m, 2H), 7.32−7.29, (m, 3H), 5.88 (ddt, J = 6.0 Hz, 10.5 Hz, 17.0 Hz, 1H), 5.27 (d, J = 17.0 Hz, 2H), 5.17 (d, J = 10.5 Hz, 2H), 3.23 (dd, J = 5.0 Hz, 13.5 Hz, 1H), 3.19 (d, J = 9.0 Hz, 1H), 2.91 (dq, J = 16.5 Hz, 6.5 Hz, 1H), 1.13 (d, J = 6.5 Hz, 3H), 1.05 (d, J = 6.5 Hz, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 136.2, 131.7, 128.4, 128.2, 127.8, 123.6, 117.4, 86.4, 63.2, 58.2, 37.8, 31.0, 20.8, 19.9 ppm. IR (thin film): 1952, 1643, 1598, 1488, 1443, 1412, 1383, 1364, 1326, 1261, 1208, 1163, 1096, 1069, 1027, 995, 917, 753, 689, 595, 545 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{16}H_{22}N$, 228.1752; found, 228.1751.

N-Allyl-N-(2,4-dimethoxybenzyl)non-4-yn-3-amine (**s7**). Prepared from the 3-component coupling of propionaldehyde, 1-hexyne, and *n*-allyldimethoxybenzylamine.[17]

N-Methyl-N-(3-(p-tolyl)prop-2-yn-1-yl)prop-2-en-1-amine (**s8**). Prepared from the 3-component coupling of formaldehyde, 1-ethynyl-4-methylbenzene, *n*-allylmethylamine, CuBr, oven-dried molecular sieves (Grade 564, 3 Å, 8−12 mesh) (~1 g), and acetonitrile (100 mL) with flash chromatography purification using silica gel eluting with 9:1 hexanes/EtOAc to yield a light yellow oil (78%). R_f = 0.44 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.33 (d, J = 8.3 Hz, 2H), 7.09 (d, J = 8.3 Hz, 2H), 5.89 (ddt, J = 4.0 Hz, 6.5 Hz, 10.3 Hz, 1H), 5.25 (d, J = 17.5 Hz, 1H), 5.17 (d, J = 10.3 Hz, 1H), 3.54 (s, 1H), 3.14 (d, J = 6.5 Hz, 2H), 2.38 (s, 3H), 2.33 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 138.1, 135.1, 131.6, 129.0, 120.1, 118.3, 85.6, 83.3, 59.1, 46.0, 41.6, 21.4 ppm. IR (thin film): 2918, 1787, 1643, 1509, 1449, 1359, 1325, 1254, 1193, 1128, 1107, 1032, 994, 968, 921, 814, 677, 629, 566 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{14}H_{18}N$, 200.1439; found, 200.1440.

N-Methyl-N-(3-(4-(trifluoromethyl)phenyl)prop-2-yn-1-yl)prop-2-en-1-amine (**s9**). Prepared from the 3-component coupling of formaldehyde, 1-ethynyl-4-trifluoromethylbenzene, and *n*-allylmethylamine.[13]

General Procedure for the Deallylation of Amines. *1-(4-Methoxyphenyl)-N-methyl-3-phenylprop-2-yn-1-amine* (**1a**). In a 250 mL round-bottom flask containing a magnetic stir bar were added $Pd(PPh_3)_4$ (0.22 g, 0.19 mmol), *N,N*-dimethylbarbituric acid (9.0 g, 57.69 mmol), and CH_2Cl_2 (100 mL). A solution of *N*-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)-*N*-methylprop-2-en-1-amine (**s1**) (5.6 g, 19.23 mmol) in 25 mL of CH_2Cl_2 was added, and the reaction mixture was allowed to stir at room temperature under N_2 for 12 h. The solvent was then removed under reduced pressure, and the crude product was redissolved in Et_2O (75 mL). The organic layer was washed with $NaHCO_3$ (20 mL) and then acidified with 2 M HCl (5 mL). The aqueous layer was collected, neutralized with 10% NaOH, and partitioned with CH_2Cl_2 (70 mL). The organic layer was collected, and the aqueous layer was extracted with additional CH_2Cl_2 (2 × 50 mL). The organic extracts were combined and then dried and filtered over Na_2SO_4 to give a dark orange oil (2.13 g, 44%). R_f = 0.22 (2:1 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.54−7.48 (m, 4H), 7.33−7.31 (m, 3H), 6.9 (d, J = 8.7 Hz, 2H), 5.18 (s, 1H), 3.81 (s, 3H), 2.56 (s, 3H), 1.81 (s, 1H) ppm. ^{13}C NMR ($CDCl_3$, 75 MHz): δ 159.2, 132.4, 131.7, 128.8, 128.3, 128.1, 123.1, 113.8, 89.2, 85.5, 55.6, 55.3, 33.7 ppm. IR (thin film): 2953, 2834, 2790, 1609, 1584, 1508, 1488, 1462, 1440, 1301, 1243, 1171, 1095, 1031, 956, 913, 829, 754, 727, 703, 689, 573, 547, 524 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{17}H_{17}NONa$, 274.1208; found, 274.1213.

1-(4-Chlorophenyl)-N-methyl-3-phenylprop-2-yn-1-amine (**1b**). Prepared from the deallylation of **s2** (8.0 g, 26.29 mmol) as a dark orange oil (3.29 g, 49%). R_f = 0.29 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.54−7.61 (m, 2H), 7.50−7.48 (m, 2H), 7.36−7.29 (m, 5H), 4.72 (s, 1H), 2.54 (s, 3H), 1.43 (s, 1H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 139.9, 133.4, 132.0, 129.3, 128.8, 128.6, 128.5, 123.1, 88.7, 86.3, 55.8, 33.9 ppm. IR (thin film): 1488, 1442, 1264, 1090, 1015, 732, 703, 691, 579, 543 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{16}H_{15}NCl$, 256.0893; found, 256.0890.

N-(3-Cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylprop-2-en-1-amine (**1c**). Prepared from the deallylation of **s3** as a dark orange oil (1.07 g, 42%). R_f = 0.23 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.38 (d, J = 8.5 Hz, 2H), 6.85 (d, J = 8.5 Hz, 2H), 4.40 (s, 1H), 2.42 (s, 3H), 1.31−1.25 (m, 1H), 0.79−0.73 (m, 2H), 0.70−0.66 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 159.3, 133.0, 132.3, 128.9, 113.9, 89.2, 75.0, 55.5, 33.7, 8.5, 0.2 ppm. IR (thin film): 1609, 1508, 1463, 1440, 1301, 1243, 1171, 1029, 892, 831, 810, 779, 722, 585, 541 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{14}H_{18}NO$, 216.1388; found, 216.1393.

N-(1-(4-Methoxyphenyl)-3-phenylprop-2-yn-1-yl)prop-2-en-1-amine (**1d**). Prepared from the deallylation of **s4** (3.55 g, 11.2 mmol) as a dark orange oil (0.96 g, 31%). R_f = 0.59 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.52 (d, J = 8.5 Hz, 2H), 7.49−7.47 (m, 2H), 7.33−7.31 (m, 3H), 6.92 (d, J = 8.5 Hz, 2H), 5.97 (ddt, J = 7 Hz, 10.5 Hz, 6.5 Hz, 1H), 5.27 (dd, J = 17 Hz, 1.5 Hz), 5.14 (dd, J = 10.5 Hz, 1.5 Hz), 4.70 (s, 1H), 3.82 (s, 3H), 3.44 (dqt, J = 6 Hz, 13.5 Hz, 1.5 Hz, 2H), 1.67 (s, 1H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 159.4, 136.6, 132.8, 131.9, 129.0, 128.5, 128.4, 116.7, 114.1, 89.7, 85.6, 55.6, 53.5, 30.1 ppm. IR (thin film): 2834, 1609, 1585, 1508, 1489, 1442, 1417, 1302, 1245, 1171, 1094, 1070, 1033, 995, 917, 832, 788, 756, 691, 579, 548 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{19}H_{20}NO$, 278.1545; found, 278.1537.

1-Cyclopropyl-N,4-dimethylpent-1-yn-3-amine (**1e**). Prepared from the deallylation of **s5**.[17]

N,4-Dimethyl-1-phenylpent-1-yn-3-amine (**1f**). Prepared from the deallylation of **s6** (1.36 g, 6.0 mmol) as a dark orange oil (0.78g, 70%). R_f = 0.35 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.44−7.40 (m, 2H), 7.30−7.24 (m, 3H), 3.31 (s, 1H), 2.56 (s, 3H), 1.61 (br s, 1H), 1.06−1.04 (m, 6H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 131.7, 128.2, 127.8, 123.5, 89.2, 84.7, 59.0, 24.6, 32.7, 19.8, 17.9 ppm. IR (thin film): 2958, 2870, 1597, 1489, 1467, 1442, 1383, 1366, 1343, 1322, 1131, 1106, 1070, 1028, 990, 914, 754, 689, 580, 545 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{13}H_{18}N$, 188.1439; found, 188.1447.

N-(2,4-Dimethoxybenzyl)non-4-yn-3-amine (**1g**). Prepared from the deallylation of **s7**.[17]

N-Methyl-3-(p-tolyl)prop-2-yn-1-amine (**1h**). Prepared from the deallylation of **s8** as a dark orange oil (226 mg, 35%). R_f = 0.18 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.31 (d, J = 8 Hz, 2H), 7.09 (d, J = 8.5 Hz, 2H), 3.60 (s, 2H), 2.53 (s, 3H), 2.33 (s, 3H), 1.15 (br s, 1H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 128.2, 131.5, 129.0, 85.9, 84.1, 40.5, 35.0, 21.4 ppm. IR (thin film): 2919, 2791, 1792, 1675, 1548, 1508, 1427, 1407, 1379, 1345, 1257, 1180, 1107, 1077, 1020, 948, 815, 753, 722, 696, 541 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{11}H_{13}N$, 160.1126; found, 160.1135.

N-Methyl-3-(4-(trifluoromethyl)phenyl)prop-2-yn-1-amine (**1i**). Prepared from the deallylation of **s9**.[13]

N-Benzylprop-2-yn-1-amine (**1j**). Prepared according to Merlic et al.[18]

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General Procedure for the Preparation of Potassium *N*-Cyanobenzamides (2a). *Potassium N-Cyano-2-fluorobenzamide.* A one-necked 500 mL round-bottom flask open to the atmosphere, equipped with a magnetic stirring bar, was charged with cyanamide (6.3 g, 0.15 mol) and distilled water (200 mL). Sodium hydroxide pellets (12.3 g, 0.308 mol) were then added in portions (~3 × 4 g) over a 15 min period. The mixture was then stirred for 30 min at room temperature and then cooled to 0 °C. The flask was fitted with a 1000 mL addition funnel, and the addition funnel was charged with 2-fluorobenzoyl chloride (23.5 g, 0.15 mol). The 2-fluorobenzoyl chloride was then added dropwise over a span of 20 min. After addition of the benzoyl chloride, the reaction was stirred for an additional 3 h at room temperature. The mixture was transferred to a 500 mL separatory funnel and washed with diethyl ether (1 × 50 mL). The aqueous layer was then transferred to a 1 L Erlenmeyer flask equipped with a magnetic stirring bar and acidified to pH 2 with concd HCl (~15 mL). Dichloromethane (200 mL) was then added to dissolve the solids, and the mixture was transferred to a 500 mL separatory funnel. After separation of the layers, the aqueous fraction was extracted with dichlormethane (2 × 100 mL), and the combined organics were dried over anhydrous Na_2SO_4. The organics were filtered through a sintered glass funnel, and the resulting sodium sulfate was washed with dichloromethane (2 × 50 mL). The solvent was removed on a rotary evaporator, and then the flask was transferred to a high-vac line for 3 h. The resulting white solid was then dissolved in MeOH (50 mL) and added dropwise to a 500 mL round-bottom flask equipped with a stir bar containing potassium hydroxide (8.0 g, 0.143 mol) dissolved in MeOH (200 mL) at 0 °C. The flask was stoppered and allowed to stand in a −20 °C freezer overnight. The crude solid was collected on a Buchner funnel and washed with cold MeOH (2 × 50 mL) to give a fine white powder after sufficient drying under vacuum (19.8 g, 65%). Mp 276−278 °C. ^{1}H NMR (DMSO-d_6, 500 MHz): δ 7.63 (td, J = 7.7, 1.9 Hz, 1H), 7.32 (tdd, J = 7.3, 4.9, 2.0 Hz, 1H), 7.10−7.02 (m, 2H) ppm. ^{13}C NMR (DMSO-d_6, 125 MHz): δ 173.2, 160.0 (d, J_{CF} = 250.0 Hz), 130.7 (d, J_{CF} = 3.1 Hz), 130.6 (d, J_{CF} = 8.4 Hz), 128.1 (d, J_{CF} = 11.8 Hz), 123.4 (d, J_{CF} = 2.6 Hz), 121.9, 116.0 (d, J_{CF} = 22.7 Hz) ppm. IR (solid) 2160, 1626, 1612, 1612, 1591, 1547, 1485, 1450, 1360, 1293, 1220, 1108, 1098, 1039, 897 cm^{-1}. HRMS (ESI-TOF) $[M - H]^-$ m/z: calcd $C_8H_4N_2OF$, 163.0308; found, 163.0308.

*Potassium N-Cyano-4-methoxybenzamide (**2b**).* Prepared according to the general procedure for the preparation of potassium cyanobenzamides using 4-methoxybenzoyl chloride to yield a white solid (47% yield). Mp 328−330 °C (dec). ^{1}H NMR (DMSO-d_6, 500 MHz): δ 7.86 (d, J = 8.8 Hz, 2H), 6.84 (d, J = 8.8 Hz, 2H), 3.76 (s, 3H) ppm. ^{13}C NMR (DMSO-d_6, 125 MHz): δ 174.5, 160.8, 131.1, 129.8, 123.2, 112.6, 55.1 ppm. IR (solid) 2154, 1593, 1550, 1508, 1344, 1308, 1241, 1169, 1157, 1117, 1105, 1037, 1021, 1001, 951, 886 cm^{-1}. HRMS (ESI-TOF) $[M - H]^-$ m/z: calcd $C_9H_7N_2O_2$, 175.0508; found, 175.0513.

*Potassium N-Cyano-4-chlorobenzamide (**2c**).* Prepared according to the general procedure for the preparation of potassium cyanobenzamides using 4-chlorobenzoyl chloride to yield a white solid (62% yield). Mp >350 °C. ^{1}H NMR (DMSO-d_6, 500 MHz): δ 7.91 (d, J = 8.5 Hz, 2H), 7.35 (d, J = 8.5 Hz, 2H) ppm. ^{13}C NMR (DMSO-d_6, 125 MHz): δ 173.6, 137.3, 134.7, 130.0, 127.5, 122.5 ppm. IR (solid) 2154, 1588, 1548, 1487, 1402, 1340, 1283, 1193, 1173, 1094, 1019, 1007, 885 cm^{-1}. HRMS (ESI-TOF) $[M - H]^-$ m/z: calcd $C_8H_4N_2OCl$, 179.0012; found, 179.0017.

*Potassium N-Cyanobenzamide (**2d**).* Prepared according to the general procedure for the preparation of potassium cyanobenzamides using benzoyl chloride to yield a white solid (65% yield). Mp 345−347 °C. ^{1}H NMR (DMSO-d_6, 500 MHz): δ 7.93 (d, J = 6.9 Hz, 2H), 7.38 (t, J = 7.3 Hz, 1H), 7.31 (d, J = 6.9 Hz, 2H) ppm. ^{13}C NMR (DMSO-d_6, 125 MHz): δ 175.0, 138.4, 129.9, 128.1, 127.5, 123.1 ppm. IR (solid) 2160, 1595, 1556, 1492, 1446, 1344, 1300, 1103, 1028, 1012, 934, 890 cm^{-1}. HRMS (ESI-TOF) $[M - H]^-$ m/z: calcd $C_8H_5N_2O$, 145.0402; found, 145.0398.

*Potassium Benzyloxycarbonylcyanamide (**2e**).* Prepared according to Looper et al.[19]

Preparation of Mono-*N*-acylguanidines from Propargylamines. *2-Fluoro-N-(N-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3a**).* In a 50 mL round-bottom flask containing a magnetic stir bar were added **2a** (97 mg, 0.48 mmol), chlorotrimethylsilane (64 μL, 0.50 mmol), and acetonitrile (10 mL) under N_2. The solution was stirred at room temperature for 10 min. A solution of **1a** (100 mg, 0.40 mmol) in acetonitrile (5 mL) was then added, and the reaction mixture was allowed to stir at room temperature for 1 h. The solvent was then removed under reduced pressure, and the crude product was redissolved in EtOAc (50 mL). The organic layer was washed with $NaHCO_3$ (20 mL) and brine (20 mL), dried, and filtered over Na_2SO_4. The crude product was purified via flash chromatography, eluting with 6:4 hexanes/EtOAc to give a foamy white oil (124 mg, 75% yield). Compound **3a** was prepared by guanylation of **1a** (100 mg, 0.40 mmol) with **2a** (89 mg, 0.48 mmol) as a foamy white oil (124 mg, 75%). R_f = 0.16 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.06 (t, J = 12.5 Hz, 1H), 7.65 (s, 1H), 7.58−7.51 (m, 4H), 7.38−7.32 (m, 4H), 7.18 (t, J = 13.0 Hz, 1H), 7.07 (t, J = 13.0 Hz, 1H), 6.92 (d, J = 14.5 Hz, 2H), 3.81 (s, 3H), 2.86 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.5, 162.0 (d, J_{CF} = 254.3 Hz), 160.7. 159.7. 148.0. 138.4. 132.2. 132.1 (2), 129.0, 128.8 (d, J_{CF} = 24.6 Hz), 128.6, 123.6 (d, J_{CF} = 3.9 Hz), 122.6, 116.8 (d, J_{CF} = 23.2 Hz), 114.7, 114.2, 87.0, 75.4, 55.6, 50.9, 29.3 ppm. IR (thin film): 1673, 1588, 1560, 1533, 1509, 1452, 1423, 1355, 1304, 1247, 1218, 1173, 1153, 1030, 897, 845, 758, 732, 691, 590, 550 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{25}H_{22}N_3O_2NaF$, 438.1594; found, 438.1599.

*4-Methoxy-N-(N-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3b**).* Prepared by guanylation of **1a** (100 mg, 0.40 mmol) with **2b** (103 mg, 0.48 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (119.8 mg, 70% yield). R_f = 0.13 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.25 (d, J = 9.5 Hz, 2H), 7.65 (s, 1H), 7.58 (d, J = 9.0 Hz, 2H), 7.55−7.52 (m, 2H), 7.37−7.35 (m, 3H), 6.92−6.91 (m, 2H), 3.84 (s, 3H), 3.81 (s, 3H), 2.87 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.9, 162.3, 160.7, 159.7, 132.1, 131.8, 131.3, 129.0, 128.6, 122.7, 114.3, 113.3, 87.0, 85.5, 55.6, 55.5, 50.8, 29.4 ppm. IR (thin film): 1583, 1558, 1528, 1508, 1464, 1424, 1351, 1305, 1263, 1248, 1173, 1155, 1032, 893, 788, 730, 701, 653, 554 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{26}H_{25}N_3O_3Na$, 450.1794; found, 450.1799.

*4-Chloro-N-(N-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3c**).* Prepared by guanylation of **1a** (100 mg, 0.40 mmol) with **2c** (105 mg, 0.48 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (140 mg, 81%). R_f = 0.22 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.20 (d, J = 8.5 Hz, 2H), 7.65 (s, 1H), 7.57−7.51 (m, 4H), 7.38−7.33 (m, 5H), 6.92 (d, J = 8.5 Hz, 2H), 3.82 (s, 3H), 2.89 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.1, 160.9, 159.8, 137.5, 137.4, 132.1, 130.8, 129.4, 129.0, 128.9, 128.6, 128.3, 122.6, 114.3, 87.2, 85.2, 55.6, 50.9, 29.5 ppm. IR (thin film): 1583, 1582, 1528, 1508, 1488, 1464, 1421, 1350, 1304, 1246, 1171, 1116, 1111, 1086, 1058, 1034, 1012, 996, 974, 893, 853, 801, 772, 755, 733, 710, 689, 621, 587, 553 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{25}H_{23}N_3O_2Cl$, 432.1479; found, 432.1489.

*N-(N-(1-(4-Methoxyphenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3d**).).* Prepared by guanylation of **1a** (100 mg, 0.40 mmol) with **2c** (81 mg, 0.48 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (121.3 mg, 76% yield). R_f = 0.22 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.28 (d, J = 7 Hz, 2H), 7.71 (s, 1H), 7.58 (d, J = 9 Hz, 2H), 7.55−7.52 (m, 2H), 7.47−7.33 (m, 7H), 6.92 (d, J = 8 Hz, 2H), 3.82 (s, 3H), 2.89 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 177.2, 160.9, 159.7, 139.0, 132.1, 131.3, 129.6, 129.4, 129.0, 128.9, 128.6, 128.1, 122.6, 114.2, 87.1, 85.4, 55.6, 50.9, 29.4 ppm. IR (thin film): 1587, 1556, 1530, 1508, 1489, 1448, 1422, 1353, 1299, 1247, 1171, 1067, 1026, 891, 756, 733, 710, 689, 621, 587, 553 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{25}H_{23}N_3O_2Na$, 420.1688; found, 420.1697.

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*N-(N-(1-(4-Chlorophenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)-2-fluorobenzamide (**3e**).* Prepared by guanylation of **1b** (100 mg, 0.39 mmol) with **2a** (81 mg, 0.47 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (90 mg, 62% yield). R_f = 0.32 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.03 (t, J = 7.5 Hz, 1H), 7.69 (s, 1H), 7.58 (d, J = 8.5 Hz, 2H), 7.53−7.51 (m, 2H), 7.39−7.33 (m, 6H), 7.14 (t, J = 8.0, 1H), 7.13−7.05 (m, 1H), 2.87 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.6, 162.0 (d, J_{CF} = 254.6 Hz), 160.7, 136.1, 134.3, 132.2 (d, J_{CF} = 8.8 Hz), 132.0 (3), 128.1, 129.0 (2), 128.6, 126.6 (d, J_{CF} = 15.2 Hz), 122.3, 116.8 (d, J_{CF} = 23.3 Hz), 87.5, 84.5, 50.9, 29.4 ppm IR (thin film): 1683, 1589, 1560, 1531, 1488, 1452, 1426, 1353, 1327, 1290, 1263, 1218, 1175, 1152, 1130, 1091, 1062, 1032, 1014, 897, 844, 791, 756, 737, 691, 669, 539 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{24}H_{19}N_3OFNaCl$, 442.1098; found, 442.1099.

*N-(N-(1-(4-Chlorophenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)-4-methoxybenzamide (**3f**).* Prepared by guanylation of **1b** (100 mg, 0.39 mmol) with **2b** (101 mg, 0.47 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (94 mg, 56% yield). R_f = 0.21 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.21 (d, J = 9.0 Hz, 2H), 7.73 (s, 1H), 7.59 (d, J = 8.5 Hz, 2H), 7.53−7.51 (m, 2H), 7.36−7.33 (m, 5H), 6.89 (d, J = 9.0 Hz, 2H), 3.83 (s, 3H), 2.86 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 177.0, 162.4, 160.7, 136.3, 134.3, 132.1, 131.6, 131.3, 129.1, 128.7, 122.4, 113.3, 87.5, 84.7, 50.6, 50.8, 29.5 ppm. IR (thin film): 1654, 1603, 1455, 1383, 1300, 1273, 1257, 1169, 1125, 1069, 1035, 1011, 932, 914, 855, 769, 685, 639, 612 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{25}H_{22}N_3O_2NaCl$, 454.1298; found, 454.1296.

*4-Chloro-N-(N-(1-(4-chlorophenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3g**).* Prepared by guanylation of **1b** (100 mg, 0.39 mmol) with **2c** (102 mg, 0.47 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (80 mg, 47% yield). R_f = 0.37 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.17 (d, J = 8.5 Hz, 2H), 7.68 (s, 1H), 7.57 (d, J = 8.5 Hz, 2H), 7.54−7.52 (m, 2H), 7.39−7.35 (m, 7H), 2.89 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.2, 173.2, 160.9, 137.5, 137.3, 136.0, 134.5, 132.1, 130.8, 129.2, 129.1, 129.0, 128.7, 128.3, 122.3, 87.7, 84.4, 51.0, 29.6 ppm. IR (thin film): 3310, 3169, 1684, 1586, 1556, 1523, 1488, 1469, 1422, 1358, 1323, 1290, 1242, 1159, 1031, 1089, 1064, 1015, 997, 978, 896, 856, 792, 779, 755, 689, 629, 548 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{24}H_{20}N_3OCl_2$, 436.0983; found, 436.0988.

*N-(N-(1-(4-Chlorophenyl)-3-phenylprop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3h**).* Prepared by guanylation of **1b** (100 mg, 0.39 mmol) with **2d** (81 mg, 0.47 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (90 mg, 57% yield). R_f = 0.27 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.26 (d, J = 8.0 Hz, 2H), 7.55 (s, 1H), 7.60 (d, J = 8.5 Hz, 2H), 7.58−7.52 (m, 2H), 7.48−7.33 (m, 8H), 2.88 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 177.3, 160.9, 138.8, 136.2, 134.4, 132.1, 131.4, 129.4, 129.1, 128.7, 128.1, 122.3, 87.6, 84.6, 50.9, 29.5 ppm. IR (thin film): 1585, 1580, 1509, 1490, 1456, 1356, 1329, 1250, 1172, 1156, 1101, 1032, 892, 850, 788, 758, 692 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{24}H_{21}N_3OCl$, 402.1373; found, 402.1374.

*N-(N-(3-Cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylcarbamimidoyl)-2-fluorobenzamide (**3i**).* Prepared by guanylation of **1c** (100 mg, 0.46 mmol) with **2a** (93 mg, 0.46 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (74% yield). R_f = 0.21 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.02 (dt, J = 1.8, 7.8 Hz, 1H), 7.45 (d, J = 8.5 Hz, 2H), 7.38−7.33 (m, 1H), 7.18 (t, J = 7.8 Hz, 1H), 7.06 (dd, J = 1.0, 8.3 Hz, 1H), 6.87 (d, J = 7.3 Hz, 2H), 3.79 (s, 3H), 2.76 (s, 3H), 1.39−1.31 (m, 1H), 0.85−0.80 (m, 2H), 0.78−0.73 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.4, 162.9 (d, J_{CF} = 254.4 Hz), 160.5, 159.4, 132.2 (d, J_{CF} = 9.8 Hz), 132.0, 131.9, 128.8, 127.8 (d, J_{CF} = 9.0 Hz), 123.5 (d, J_{CF} = 3.8 Hz), 116.8 (d, J_{CF} = 23.2 Hz), 113.9, 90.7, 71.2, 55.5, 50.4, 8.5 (2) ppm. IR (thin film): 3336, 2933, 1588, 1559, 1536, 1509, 1453, 1425, 1353, 1248, 1173, 1031, 897 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{22}H_{22}N_3O_2NaF$, 402.1594; found, 402.1601.

*N-(N-(3-Cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylcarbamimidoyl)-4-methoxybenzamide (**3j**).* Prepared by guanylation of **1c** (100 mg, 0.46 mmol) with **2b** (100 mg, 0.46 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (83% yield). R_f = 0.16 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.2 (d, J = 6.0 Hz, 2H), 7.47 (d, J = 7.5 Hz, 2H), 6.87 (t, J = 7.5 Hz, 4H), 3.83 (s, 3H), 3.78 (s, 3H), 2.77 (s, 3H), 1.40−1.32 (m, 1H), 0.86−0.80 (m, 2H), 0.79−0.73 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.7, 173.1 162.1, 160.5, 159.4, 131.7, 131.1, 130.1, 128.8, 113.9, 113.1, 90.6, 71.2, 55.4, 50.3, 29.1 8.6, 8.5 ppm. IR (thin film): 2933, 1585, 1528, 1507, 1462, 1349, 1346, 1152, 1029 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{23}H_{26}N_3O_3$, 392.1974; found, 392.1974.

*4-Chloro-N-(N-(3-cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3k**).* Prepared by guanylation of **1c** (100 mg, 0.46 mmol) with **2c** (100 mg, 0.46 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (80% yield). R_f = 0.35 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.17 (d, J = 8.4 Hz, 2H), 7.45 (d, J = 7.9 Hz, 2H), 7.43 (d, J = 9.1 Hz, 2H), 6.87 (d, J = 8.4 Hz, 2H), 3.79 (s, 3H), 2.78 (s, 3H), 1.40−1.33 (m, 1H), 0.86−0.82 (m, 2H), 0.79−0.74 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.9, 173.1, 160.7, 159.5, 137.5, 137.2, 130.7, 129,8, 128.7, 128.1, 114.0, 90.8, 71.0, 55.4, 50.5, 29.2, 8.6, 8.5 ppm. IR (thin film): 3355, 2932, 1552, 1530, 1508, 1422, 1349, 1246, 1172, 1087, 1030, 1013 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{22}H_{22}N_3O_2NaCl$, 418.1303; found, 418.1300.

*N-(N-(3-Cyclopropyl-1-(4-methoxyphenyl)prop-2-yn-1-yl)-N-methylcarbamimidoyl)benzamide (**3l**).* Prepared by guanylation of **1c** (100 mg, 0.46 mmol) with **2d** (85 mg, 0.46 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (65% yield). R_f = 0.26 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.25 (d, J = 7.2 Hz, 2H), 7.48 (d, J = 9.7 Hz, 2H), 7.44 (d, J = 7.9 Hz, 1H), 7.39 (d, J = 7.9 Hz, 2H), 6.87 (d, J = 8.8 Hz, 2H), 3.79 (s, 3H), 2.78 (s, 3H), 1.4−1.33 (m, 1H), 0.86−0.81 (m, 2H), 0.79−0.75 (m, 2H). ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.9, 160.7, 159.4, 139.0, 131.2, 132.2, 131.1, 130.0, 129.2, 128.8, 127.9, 114.0, 90.7, 71.2, 55.4, 29.2, 8.6, 8.5 ppm. IR (thin film): 3346, 2962, 1588, 1552, 1536, 1467, 1423, 1353, 1329, 1168, 1066, 893 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{22}H_{23}N_3O_2Na$, 384.1688; found, 384.1693.

*Benzyl (Z)-5-Benzylidene-2-imino-4-(4-methoxyphenyl)-3-methylimidazolidine-1-carboxylate (**3m**).* Prepared by guanylation of **1a** with **2e** with purification on silica gel eluting with 1:1 hexanes/EtOAc to give a dark orange oil (2.97 g, 82%). R_f = 0.48 (1:1 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.51−7.43 (m, 6H), 7.36−7.25 (m, 7H), 6.90 (d, J = 6.3 Hz, 2H), 5.18 (s, 2H), 3.80 (s, 3H), 2.80 (s, 3H). ^{13}C NMR ($CDCl_3$, 300 MHz): δ 164.1, 160.9, 159.4, 137.6, 131.9, 129.0, 128.7, 128.6, 128.4, 128.0, 127.7, 122.2, 113.9, 86.6, 85.2, 66.9, 55.3, 50.6, 29.7 ppm. IR (thin film): 3403, 2932, 1646, 1584, 1532, 1508, 1488, 1440, 1376, 1273, 1246, 1121, 1150, 1110, 1027, 908, 845, 799, 775, 755, 729, 690, 647, 586, 552 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{26}H_{26}N_3O_3$, 428.1974; found, 428.1979.

*N-(N-Allyl-N-(1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-yl)-carbamimidoyl)-2-fluorobenzamide (**3n**).* Prepared by guanylation of **1d** with **2a** with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (54% yield). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.08 (dt, J = 8.0 Hz, 2.0 Hz, 1H), 7.64 (s, 1H), 7.61 (d, J = 9.0 Hz, 2H), 7.40−7.3 (m, 2H), 7.15 (t, J = 7.5 Hz, 1H), 7.08 (dd, J = 11.0 Hz, 8.5 Hz, 1H), 6.91 (d, J = 9.0 Hz, 2H), 5.77−5.72 (m, 1H), 5.32 (d, J = 17.0 Hz, 1H), 5.25 (dd, J = 10.0 Hz, 1.5 Hz, 1H), 3.95 (ABq, J = 15 Hz, 38 Hz, 2H), 3.82 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.8, 162.0 (d, J_{CF} = 254.6 Hz), 161.0, 159.8, 134.0, 132.2 (d, J_{CF} = 8.3 Hz), 132.1 (d, J_{CF} = 1.5 Hz), 132.0, 129.7, 129.2, 128.9, 128.6, 127.8 (d, J_{CF} = 3.8 Hz), 123.6 (d, J_{CF} = 3.8 Hz), 122.6, 118.5, 114.2, 87.1, 85.7, 55.6, 50.8, 47.1 ppm. IR (thin film):

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1586, 1560, 1510, 1452, 1327, 1248, 1219, 1173, 1152, 1096, 1031, 906, 836, 757, 726, 690, 668, 646 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{27}H_{25}N_3O_2F$, 442.1931; found, 442.1925.

*2-Fluoro-N-(N-methyl-N-(4-methyl-1-phenylpent-1-yn-3-yl)-carbamimidoyl)benzamide (**3o**).* Prepared by guanylation of **1e** (100 mg, 0.53 mmol) with **2a** (128 mg, 0.64 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (136 mg, 75%). R_f = 0.29 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.00 (dt, J = 2 Hz, 7.5 Hz, 1H), 7.44−7.41 (m, 2H), 7.39−7.34 (m, 1H), 7.32−7.28 (m, 3H), 7.16−7.13 (m, 1H), 7.09−7.05 (m, 1H), 5.94 (br s, 1H), 3.05 (s, 3H), 2.11−2.05 (m, 1H), 1.17 (d, J = 7.0 Hz, 3H), 0.98 (d, J = 7.0 Hz, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.0, 161.7 (d, J_{CF} = 254.5 Hz), 160.7, 132.8 (d, J_{CF} = 9.2 Hz), 131.7 (d, J_{CF} = 3.4 Hz), 128.4, 128.3, 127.7 (d, J_{CF} = 8.9 Hz), 123.3 (d, J_{CF} = 3.8 Hz), 122.7, 116.7 (d, J_{CF} = 23.2 Hz), 86.4, 85.5, 34.8, 32.8, 29.8, 19.5, 19.1 ppm IR (thin film): 1587, 1554, 1534, 1467, 1451, 1421, 1359, 1330, 1277, 1260, 1217, 1184, 1155, 1098, 1062, 1032, 985, 896, 754, 731, 690, 626 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{21}H_{23}N_3OF$, 352.1825; found, 352.1830.

*N-(N-(1-Cyclopropyl-4-methylpent-1-yn-3-yl)-N-methylcarbamimidoyl)benzamide (**3p**).* Prepared by guanylation of **1e** (111 mg, 0.66 mmol) with **2d** (100 mg, 0.66 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (78% yield). R_f = 0.64 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.18 (d, J = 9 Hz, 1H), 7.46−7.35 (m, 2H), 5.51 (bs, 2H), 2.97 (s, 3H), 1.96 (sextet, J = 7.3 Hz, 1H), 1.3−1.22 (m, 1H), 1.09 (d, J = 7.7 Hz, 3H), 0.91 (d, J = 6.8 Hz, 3H), 0.8−0.75 (m, 2H), 0.7−0.65 (m, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 176.7, 139.1, 131.0, 129.1, 127.8, 89.2, 77.4, 54.8, 33.0, 19.6, 19.3, 8.5, 8.4 ppm. IR (thin film): 3337, 2961, 1588, 1556, 1469, 1450, 1425, 1354, 1239, 1154, 1046 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{18}H_{22}N_3OFNa$, 338.1645; found, 338.1635.

*N-(N-(2,4-Dimethoxybenzyl)-N-(non-4-yn-3-yl)carbamimidoyl)-2-fluorobenzamide (**3q**).* Prepared by guanylation of **1f** (500 mg, 1.72 mmol) with **2a** (420 mg, 2.07 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (446 mg, 63%). R_f = 0.41 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.99 (dt, J = 2.0 Hz, 8.0 Hz, 1H), 7.37−7.28 (m, 2 H), 7.14−7.11 (m, 1H), 7.07−7.03 (m, 1H), 6.49−6.45 (m, 2H), 5.98 (br s, 1H), 4.54 (s, 1H), 3.86 (s, 3H), 3.80 (s, 3H), 2.13 (dt, J = 2.0 Hz, 6.5 Hz, 2H), 1.82−1.66 (m, 2H), 1.38−1.24 (m, 4H), 1.01 (t, J = 7.0 Hz, 3H), 0.84 (t, J = 7.5 Hz, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.1, 161.7 (d, J_{CF} = 254.5 Hz), 160.4, 157.2, 131.8 (d, J_{CF} = 1.7 Hz), 131.6 (d, J_{CF} = 8.8 Hz), 129.1, 127.8 (d, J_{CF} = 8.9 Hz), 123.2 (d, J_{CF} = 3.8 Hz), 116.6 (d, J_{CF} = 23.3 Hz), 116.0, 104.5, 98.2, 86.2, 77.9, 55.4 (2), 50.8, 41.3, 30.6, 28.3, 21.8, 18.3, 13.6, 10.8 ppm. IR (thin film): 2957, 2933, 1587, 1666, 1524, 1504, 1452, 1373, 1333, 1291, 1256, 1206, 1177, 1155, 1135, 1116, 1092, 1033, 958, 907, 894, 833, 759, 730, 669, 646, 564 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{26}H_{33}N_3O_3F$, 454.2506; found, 454.2509.

*2-Fluoro-N-(N-methyl-N-(3-(p-tolyl)prop-2-yn-1-yl)-carbamimidoyl)benzamide (**3r**).* Prepared by guanylation of **1g** (150 mg, 0.94 mmol) with **1a** (228 mg, 1.13 mmol) with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (207 mg, 68%). R_f = 0.21 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.04 (t, J = 10.5 Hz, 1H), 7.39−7.32 (m, 3H), 7.16−7.02 (m, 4H), 4.66 (s, 2H), 3.11 (s, 3H), 2.32 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 175.4, 161.7 (d, J_{CF} = 254.4 Hz), 160.6, 138.7, 131.9 (3), 131.7, 127.6 (d, J_{CF} = 8.8 Hz), 123.4 (d, J_{CF} = 3.8 Hz), 116.6 (d, J_{CF} = 22.8 Hz), 84.8, 82.6, 39.1, 33.7, 21.5 ppm. IR (thin film): 1587, 1546, 1509, 1431, 1423, 1333, 1261, 1215, 1178, 1153, 1134, 1098, 1065, 1021, 946, 896, 816, 758, 729, 654, 569 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{19}H_{19}N_3OF$, 324.1512; found, 324.1519.

*N-(N-Methyl-N-(3-(4-(trifluoromethyl)phenyl)prop-2-yn-1-yl)-carbamimidoyl)benzamide (**3s**).* Prepared by guanylation of **1h** with **2d** with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (1.23g, 58%). R_f = 0.24 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.26−8.24 (m, 2H), 7.55−7.26 (m, 7H), 4.76 (s, 2H), 3.13 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 177.3, 160.9, 138.9, 132.3, 131.4, 130.5 (q, J_{CF} = 32.5 Hz), 129.3, 128.1, 125.5 (q, J_{CF} = 3.7 Hz), 124.0 (q, J_{CF} = 270.6 Hz), 86.6, 83.3, 39.4, 34.0 ppm. IR (thin film): 1589, 1555, 1424, 1318, 1163, 1120, 1064, 1016, 907 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{19}H_{17}N_3OF_3$, 360.1324; found, 360.1324.

*N-(N-Benzyl-N-(prop-2-yn-1-yl)carbamimidoyl)benzamide (**3t**).* Prepared by guanylation of **1i** with **2d** with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (127.2 mg, 35%). R_f = 0.43 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.25 (d, J = 7.0 Hz, 2H), 7.47−7.29 (m, 8H), 4.83 (s, 2H), 4.36 (s, 2H), 2.34 (t, J = 2.5 Hz, 1H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 177.6, 161.2, 138.9, 136.2, 131.4, 129.4, 12.3, 128.2, 128.1, 127.5, 78.4, 73.7, 50.8, 37.0 ppm. IR (thin film): 1588, 1553, 1530, 1450, 1418, 1367, 1332, 1298, 1202, 1166, 1118, 1068, 1027, 1001, 958, 907 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{18}H_{18}N_3O$, 292.1450; found, 292.1448.

NaH-Mediated Cyclizations. *N-(4-Benzyl-5-(4-methoxyphenyl)-1-methyl-1H-imidazol-2(3H)-ylidene)-2-fluorobenzamide (**4a**).* In a 25 mL round-bottom flask containing a magnetic stir bar were added **3a** (402.5 mg, 0.97 mmol) and THF (30 mL) under N_2. The solution was stirred at room temperature, and NaH (22.5 mg, 0.97 mmol) was added, resulting in a bright yellow solution. The reaction was stirred for 30 min, after which the solvent was removed under reduced pressure, and the crude product was redissolved in EtOAc (25 mL). The organic layer was washed with saturated aqueous NH_4Cl (10 mL) and brine (10 mL), dried over Na_2SO_4, filtered, and concentrated. The resulting yellow solid required no further purification (330 mg, 82%). R_f = 0.41 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.07 (t, J = 8.0 Hz, 2H), 7.34−7.32 (m, 1H), 7.32−7.27 (m, 4H), 7.21 (t, J = 8.5 Hz, 1H), 7.19−7.16 (m, 3H), 7.08 (t, J = 9.5 Hz, 1H), 7.00 (d, J = 8.5 Hz, 2H), 3.86 (s, 3H), 3.81 (s, 2H), 3.44 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 171.8k, 162.5 (d, J_{CF} = 253.4 Hz), 160.2, 148.7, 137.8, 131.8, 131.7 (d, J_{CF} = 1.9 Hz), 131.6, 128.8, 128.2, 126.8, 126.4, 124.8, 123.6 (d, J_{CF} = 3.8 Hz), 119.9, 116.5 (d, J_{CF} = 22.9 Hz), 114.5, 55.4, 31.0, 30.1 ppm. IR (thin film): 2929, 2360, 2340, 1684, 1569, 1511, 1494, 1455, 1401, 1339, 1290, 1248, 1176, 1032, 834, 815, 757, 731, 696, 667 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{25}H_{22}N_3O_2FNa$, 438.1594; found, 438.1601.

*N-(4-Benzyl-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-4-methoxybenzamide (**4b**).* Prepared via NaH-mediated cyclization of (**3b**) (31.5 mg, 0.074 mmol) in THF as a yellow foam (26.5 mg, 84%). R_f = 0.21 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 300 MHz): δ 8.08 (d, J = 8.7 Hz, 2H), 7.30−7.21 (m, 5H), 7.14 (d, J = 8.7 Hz, 2H), 7.01 (d, J = 9.0 Hz, 2H), 6.90 (d, J = 8.7 Hz, 2H), 3.87 (s, 3H), 3.85 (s, 3H), 3.82 (s, 2H), 3.47 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 161.8, 160.2, 137.7, 131.6, 130.5, 128.5, 128.2, 126.8, 124.4, 119.9, 114.5, 113.1, 55.4, 55.3, 30.7, 30.0 ppm. IR (thin film): 1671, 1603, 1567, 1508, 1454, 1414, 1398, 1349, 1308, 1289, 1246, 1175, 1163, 1108, 1028, 1005, 882, 835, 799, 765, 733, 697, 608 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{26}H_{26}N_3O_3$, 428.1974; found, 428.1971.

*N-(4-Benzyl-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-4-chlorobenzamide (**4c**).* Prepared via NaH-mediated cyclization of **3c** in THF as a yellow foam (42.2 mg, 82%). R_f = 0.38 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.19 (d, J = 8.0 Hz, 2H), 7.34 (d, J = 8.0 Hz, 2H), 7.30−7.21 (m, 5H), 7.12 (d, J = 7.5 Hz, 2H), 7.01 (d, J = 8.0 Hz, 2H), 3.86 (s, 3H), 3.82 (s, 2H), 3.47 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 173.7, 160.5, 150.6, 137.6, 137.2, 136.8, 131.8, 130.4, 129.2, 128.4, 128.2, 127.2, 124.5, 120.4, 119.8, 113.8, 55.6, 50.8, 30.1 ppm. IR (thin film): 1670, 1603, 1566, 1508, 1453, 1348, 1307, 1280, 1242, 1174, 1162, 1108, 1027, 835, 779, 733, 697, 607 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{25}H_{23}N_3O_2Cl$, 432.1479; found, 432.1480.

*N-(4-Benzyl-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4d**).* Prepared via NaH-mediated cyclization of **3d** in THF as a yellow foam (55.4 mg, 63%). R_f = 0.47 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.27 (d, J = 7.0 Hz, 2H), 7.45−7.40 (m, 3H), 7.32−7.27 (m, 4H), 7.22−7.19 (m, 1H), 7.15 (d, J = 7.5 Hz, 2H), 7.01 (d, J = 9.0 Hz, 2H), 3.86 (s, 3H), 3.83

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(s, 2H), 3.49 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 160.5, 138.7, 131.9, 130.8, 129.2, 128.9, 128.4, 128.1, 127.2, 124.5, 120.0, 114.8, 55.7, 32.4, 31.0 ppm. IR (thin film): 3061, 2933, 1675, 1636, 1566, 1541, 1494, 1464, 1453, 199, 1350, 1288, 1246, 1174, 1108, 1025, 1004, 906, 832, 718, 709, 645, 593 cm^{-1}. HRMS $[M + H]^+$ (ESI-TOF) m/z: calcd for $C_{25}H_{24}N_3O_2$, 398.1869; found, 398.1869.

*N-(4-Benzyl-5-(4-chlorophenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-2-fluorobenzamide (**4e**).* Prepared via NaH-mediated cyclization of **3e** in THF as a yellow foam (32.7 mg, 62%). R_f = 0.38 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.08 (t, J = 2.5 Hz, 1H), 7.46 (d, J = 8 Hz, 2H), 7.40 (m, 1H), 7.30−7.25 (m, 4H), 7.22−7.10 (m, 5H), 3.84 (s, 2H), 3.43 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 171.0, 161.4 (d, J_{CF} = 252.5 Hz), 147.9, 137.7, 135.2, 132.3 (d, J_{CF} = 8.8 Hz), 131.7 (d, J_{CF} = 2.5 Hz), 131.5, 129.3, 128.9, 128.2, 126.9, 126.5, 124.3, 123.8 (d, J_{CF} = 2.5 Hz), 116.6, 116.4, 31.2, 30.5 ppm. IR (thin film): 1682, 1567, 1490, 1352, 1221, 1091, 1010, 906 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{24}H_{20}N_3OFCl$, 420.1279; found, 420.1278.

*N-(4-Benzyl-5-(4-chlorophenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-4-methoxybenzamide (**4f**).* Prepared via cyclization of **3f** in THF as an off-white foam (25.7 mg, 74%). R_f = 0.38 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 300 MHz): δ 8.19 (d, J = 8.7 Hz, 2H), 7.46 (d, J = 8.4 Hz, 2H), 7.30−7.23 (m, 5H), 7.13 (d, J = 8.4 Hz, 2H), 6.90 (d, J = 9.0 Hz, 2H), 3.84 (s, 2H), 3.83 (s, 2H), 3.48 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 162.0, 137.5, 135.2, 131.6, 131.4, 130.5, 129.5, 129.3, 128.9, 128.2, 128.1, 126.9, 126.5, 114.6, 113.5, 113.6, 55.3, 30.9, 30.2 ppm. IR (thin film): 1671, 1568, 1513, 1491, 1452, 1346, 1309, 1248, 1174, 1162, 1090, 881, 831, 779, 764, 728, 696, 607 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{25}H_{23}N_3O_2Cl$, 432.1479; found, 432.1480.

*N-(4-Benzyl-5-(4-chlorophenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-4-chlorobenzamide (**4g**).* Prepared via NaH-mediated cyclization of **3g** in THF as a yellow foam (35.1 mg, 64%). R_f = 0.68 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.18 (d, J = 8.5 Hz, 2H), 7.47 (d, J = 8.0 Hz, 2H), 7.35 (d, J = 8.0 Hz, 2H), 7.30−7.25 (m, 5H), 7.12 (d, J = 7.0 Hz, 2H), 3.83 (s, 2H), 3.48 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 137.1, 136.7, 135.8, 131.7, 130.4, 129.7, 129.3, 128.3, 127.4, 126.2, 123.6, 30.8, 30.4 ppm. IR (thin film): 1571, 1492, 1397, 1350, 1091, 1012, 767 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{24}H_{20}N_3OCl_2$, 436.0983; found, 436.0984.

*N-(4-Benzyl-5-(4-chlorophenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4h**).* Prepared via NaH-mediated cyclization of **3h** in THF as a white foam (39.3 mg, 77%). R_f = 0.40 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.24 (d, J = 8.0 Hz, 2H), 7.46 (d, J = 8.0 Hz, 2H), 7.45−7.39 (m, 3H), 7.30−7.20 (m, 5H), 7.12 (d, J = 7.0 Hz, 2H), 3.83 (s, 2H), 3.48 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 174.1, 149.9, 137.8, 137.7, 135.4, 131.6, 131.1, 129.6, 129.1, 128.9, 128.3, 128.1, 127.1, 126.6, 124.0, 122.6, 31.1, 30.5 ppm. IR (thin film): 1678, 1566, 1492, 1467, 1453, 1396, 1353, 1304, 1280, 1169, 1092, 1025, 1011, 876, 831, 741, 711 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{24}H_{20}N_3ONaCl$, 424.1193; found, 424.1203.

*N-(4-(Cyclopropylmethyl)-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-2-fluorobenzamide (**4i**).* Prepared via NaH-mediated cyclization of **3i** in THF as a yellow foam (45.6 mg, 86%). R_f = 0.3 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.09 (dt, J = 1.7, 6.1 Hz, 1H), 7.40−7.34 (m, 2H), 7.23 (d, J = 7.3 Hz, 2H), 7.16 (t, J = 8.4, 1H), 7.09 (dd, J = 3.0 Hz, 8.4 Hz, 1H), 6.99 (d, J = 9.0 Hz, 2H), 3.86 (s, 3H), 3.42 (s, 3H), 2.40 (d, J = 6.7 Hz, 2H), 0.97−0.88 (m, 1H), 0.56 (d, J = 8.3 Hz, 2H), 0.17 (d, J = 4.8 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 172.5, 161.5 (d, J_{CF} = 252.5 Hz), 160.1, 149.1, 131.7, 131.6 (d, J_{CF} = 2.5 Hz), 131.5 (d, J_{CF} = 8.8 Hz), 127.1 (d, J_{CF} = 8.8 Hz), 123.5 (d, J_{CF} = 3.8 Hz), 123.3, 122.4, 120.0, 116.5 (d, J_{CF} = 22.5 Hz), 114.3, 55.3, 29.9, 29.3, 10.2, 4.5 ppm. IR (thin film): 2934, 1566, 1510, 1480, 1353, 1247, 1174, 1031 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{22}H_{22}N_3O_2FNa$, 402.1594; found, 402.1598.

*N-(4-(Cyclopropylmethyl)-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-4-methoxybenzamide (**4j**).* Prepared via NaH-mediated cyclization of **3j** in THF as a yellow foam (63.2 mg, 84%). R_f = 0.27 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.27 (d, J = 8.2 Hz, 2H), 7.24 (d, J = 8.6 Hz, 2H), 7.00 (d, J = 8.6 Hz, 2H), 6.92 (d, J = 8.2 Hz, 2H), 3.86 (s, 3H), 3.85 (s, 3H), 3.45 (s, 3H), 2.39 (d, J = 6.8 Hz, 2H), 0.97−0.88 (m, 1H), 0.57 (d, J = 8.1 Hz, 2H), 0.17 (d, J = 4.7 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 174.5, 172.8, 161.8, 160.1, 131.8, 130.6, 122.9, 120.9, 120.2, 114.4, 113.1, 94.9, 55.5, 55.4, 29.8, 29.3, 10.3, 4.6 ppm. IR (thin film): 2931, 2836, 1568, 1509, 1463, 1348, 1290, 1246, 1163, 1100, 1030 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{23}H_{25}N_3O_3Na$, 414.1794; found, 414.1794.

*4-Chloro-N-(4-(cyclopropylmethyl)-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4k**).* Prepared via NaH-mediated cyclization of **3k** in THF as a yellow foam (48.2 mg, 87%). R_f = 0.48 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.24 (d, J = 7.8 Hz, 2H), 7.37 (d, J = 8.5 Hz, 2H), 7.23 (d, J = 8.2 Hz, 2H), 7.00 (d, J = 8.4 Hz, 2H), 3.86 (s, 3H), 3.45 (s, 3H), 2.40 (d, J = 6.8 Hz, 2H), 0.97−0.88 (m, 1H), 0.57 (d, J = 7.1 Hz, 2H), 0.18 (d, J = 5.5 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 173.8, 173.2, 160.3, 150.3, 137.3, 136.7, 131.8, 130.3, 128.1, 123.2, 121.7, 120.0, 114.5, 55.6, 29.9, 29.3, 10.2, 4.7 ppm. IR (thin film): 2929, 1822, 1725, 1569, 1512, 1466, 1348, 1289, 1248, 1162, 1087, 1013 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{22}H_{22}N_3O_2NaCl$, 418.1298; found, 418.1302.

*N-(4-(Cyclopropylmethyl)-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4l**).* Prepared via NaH-mediated cyclization of **3l** in THF as a yellow foam (52.3 mg, 91%). R_f = 0.55 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.31 (d, J = 7.3 Hz, 2H), 7.47−7.39 (m, 4H), 7.24 (d, J = 9.0 Hz, 3H), 7.01 (d, J = 8.7 Hz, 2H), 3.87 (s, 3H), 3.47 (s, 3H), 2.41 (d, J = 7.3 Hz, 2H), 0.97−0.89 (m, 1H), 0.58 (d, J = 7.8 Hz, 2H), 0.19 (d, J = 4.8 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 174.9, 173.0, 160.2, 138.8, 130.7, 128.9, 128.0, 123.1, 120.2, 114.5, 55.5, 29.9, 29.3, 10.3,k 4.7 ppm. IR (thin film): 2979, 1821, 1724, 1569, 1511, 1464, 1349, 1287, 1248, 1138, 1023 cm^{-1}. HRMS (ESI-TOF) $[M + Na]^+$ m/z: calcd for $C_{22}H_{23}N_3O_2Na$, 384.1688; found, 384.1690.

*Benzyl (4-Benzyl-5-(4-methoxyphenyl)-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)carbamate (**4m**).* Prepared via NaH-mediated cyclization of **3m** in THF as a yellow foam (3.0 g, 81%). R_f = 0.22 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 7.41 (d, J = 6.9 Hz, 2H), 7.29−7.19 (m, 8H), 7.11 (d, J = 6.9 Hz, 2H), 6.99 (d, J = 8.9 Hz, 2H), 5.15 (s, 2H), 3.84 (s, 3H), 3.77 (s, 2H), 3.32 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 162.9, 160.3, 150.2, 137.9, 137.8, 131.8, 129.1, 128.5, 128.3, 128.1, 127.6, 127.1, 124.6, 121.2, 120.0, 114.6, 66.9, 55.6, 31.0, 30.2 ppm. IR (thin film): 1724, 1590, 1508, 1298, 1244, 1210, 1175, 1059, 906 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{26}H_{26}N_3O_3$, 428.1974; found, 428.1974.

*N-(1-Allyl-4-benzyl-5-(4-methoxyphenyl)-1,3-dihydro-2H-imidazol-2-ylidene)-2-fluorobenzamide (**4n**).* Prepared via NaH-mediated cyclization cyclization of **3n** in THF as a yellow foam (42.6 mg, 54%). R_f = 0.50 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.06 (dt, J = 1.5 Hz, 8.0 Hz, 1H), 7.56−7.53 (m, 1H), 7.29−7.26 (m, 4H), 7.23−7.20 (m, 1H), 7.15−7.12 (m, 2H), 7.09−7.05 (m, 1H), 6.98 (d, J = 9.0 Hz, 2H), 5.91−5.83 (m, 1H), 5.12 (dd, J = 1.0 Hz, 10.0 Hz, 1H), 4.96 (dd, J = 1.0 Hz, 17.5 Hz, 1H), 3.86 (s, 3H), 3.80 (s, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 161.9 (d, J_{CF} = 252.8 Hz), 160.5, 137.9, 132.9, 132.2, 132.1, 132.0 (3), 129.1, 128.4, 127.1, 123.7 (d, J_{CF} = 3.8 Hz), 120.0, 117.8, 116.7 (d, J_{CF} = 23.2 Hz), 114.5, 55.6, 45.5, 31.1 ppm. IR (thin film): 2924, 1567, 1512, 1364, 1290, 1252, 1176, 1032, 759, 687 cm^{-1}. HRMS (ESI-TOF) $[M + H]^+$ m/z: calcd for $C_{27}H_{25}N_3O_2F$, 442.1931; found, 442.1929.

NaH-Mediated Cyclization of C^5-Alkyl or C^5-Unsubstituted Mono-*N*-acylpropargylguanidines. *N-(4-Benzyl-5-isopropyl-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-2-fluorobenzamide (**4o**).* In a 25 mL oven-dried round-bottom flask containing a magnetic stir bar were added **3o** (141 mg, 0.40 mmol), oven-dried molecular sieves (Grade 564, 3 Å, 8−12 mesh) (~20 mg), and DMF (10 mL) under N_2. The solution was stirred at room temperature, and NaH (5 mg, 0.25 mmol) was added, resulting in a bright yellow solution. The reaction temperature was then elevated to 60 °C and allowed to stir for 8 h. The solvent was removed under reduced pressure, and the

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crude product was redissolved in EtOAc (25 mL). The organic layer was washed with saturated aqueous NH_4Cl (10 mL) and saturated aqueous LiCl (3 × 10 mL). The organics were dried over Na_2SO_4, filtered, and concentrated. The resulting yellow oil was purified by column chromatography, eluting with 6:4 hexanes/EtOAc to yield an off-white foam (80.4 mg, 57%). R_f = 0.32 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.03 (t, J = 8.0 Hz, 1H), 7.35−7.03 (m, 8H), 3.92 (s, 3H), 3.12−3.05 (m, 1H), 1.31 (d, J = 7.0 Hz, 6H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 172.2, 161.5 (d, J_{CF} = 252.9), 149.3, 137.6, 131.6 (d, J_{CF} = 1.9 Hz), 131.5 (d, J_{CF} = 8.7 Hz), 128.9, 128.1, 127.0 (d, J_{CF} = 6.9 Hz), 126.9, 123.4 (d, J_{CF} = 3.7 Hz), 118.4, 116.5 (d, J_{CF} = 23.2 Hz), 31.0, 29.5, 24.5, 24.6, 19.9 ppm. IR (thin film): 1564, 1481, 1452, 1356, 1260, 1216, 1153, 1096, 1030, 906, 870, 815, 756, 724, 694, 644, 561 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{21}H_{23}N_3OF$, 352.1825; found, 352.1832.

*N-(4-(Cyclopropylmethyl)-5-isopropyl-1-methyl-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4p**).* Prepared via NaH-mediated cyclization of **3p** in DMF at 60 °C as a yellow foam (33.2 mg, 42%). R_f = 0.39 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.29 (d, J = 6.4 Hz, 2H), 7.43−7.38 (m, 3H), 3.63 (s, 3H), 3.02 (sp, J = 7.9 Hz, 1H), 2.49 (d, J = 6.8 Hz, 2H), 1.33 (d, J = 6.8 Hz, 6H), δ 0.99−0.90 (m, 1H), δ 0.63 (q, J = 4.8 Hz, 2H), δ 0.26 (q, J = 4.8 Hz, 2H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 174.7, 173.2, 138.7, 130.5, 128.7, 127.9, 126.4, 118.9, 29.4, 24.5, 21.8, 10.3, 4.7 ppm. IR (thin film): 3286, 2925, 1737, 1567, 1465, 1367, 1244, 1169, 1022 cm^{-1}. HRMS (ESI-TOF) [M + Na]$^+$ m/z: calcd for $C_{18}H_{23}N_3ONa$, 320.1739; found, 320.1743.

*N-(1-(2,4-Dimethoxybenzyl)-5-ethyl-4-pentyl-1,3-dihydro-2H-imidazol-2-ylidene)-2-fluorobenzamide (**4q**).* Prepared via NaH-mediated cyclization of **3q** in DMF at 60 °C as a colorless foam (59.2 mg, 69%). R_f = 0.44 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.04 (t, J = 7.0 Hz, 1H), 7.34−7.30 (m, 1H), 7.11−6.98 (m, 3H), 6.45 (s, 1H), 6.39 (d, J = 8.5 Hz, 1H), 5.17 (s, 2H), 3.85 (s, 3H), 3.77 (s, 3H), 2.48−2.41 (m, 4H), 1.62−1.58 (m, 1H), 1.36−1.29 (m, 4H), 0.99 (t, J = 8.0 Hz, 3H), 0.89 (t, J = 7.0 Hz, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): 172.7, 161.7 (d, J_{CF} = 253.4 Hz), 160.3, 157.3, 150.1, 131.8 (d, J_{CF} = 2.0 Hz), 131.2 (d, J_{CF} = 8.8 Hz), 129.1, 127.5, 123.3 (d, J_{CF} = 3.7 Hz), 120.2, 117.5, 116.4 (d, J_{CF} = 23.0 Hz), 110.0, 104.4, 98.2 55.4, 55.3, 39.2, 31.3, 28.8, 24.2, 22.4, 16.0, 14.5, 14.0 ppm. IR (thin film): 2931, 2858, 1611, 1587, 1563, 1500, 1482, 1460, 1420, 1356, 1287, 1264, 1208, 1157, 1119, 1034, 897, 819, 758, 734 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{26}H_{33}FN_3O_3$, 454.2506; found, 454.2501.

*2-Fluoro-N-(1-methyl-4-(4-methylbenzyl)-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4r**).* Prepared via NaH-mediated cyclization of **3r** in DMF at 60 °C as a colorless foam (57.6 mg, 58%). R_f = 0.24 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.04 (t, J = 7.5 Hz, 1H), 7.39−7.32 (m, 1H), 7.15−7.04 (m, 6H), 6.21 (s, 1H), 3.78 (s, 2H), 3.51 (s, 3H), 2.32 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 171.7, 161.4 (d, J_{CF} = 252.7 Hz), 149.0, 136.7, 133.7, 131.9 (d, J_{CF} = 8.9 Hz), 131.7 (d, J_{CF} = 2.0 Hz), 129.5, 128.5, 126.6, 126.3, 123.6 (d, J_{CF} = 3.7 Hz), 116.5 (d, J_{CF} = 23.3 Hz), 112.4, 31.8, 31.6, 21.0 ppm. IR (thin film): 1684, 1623, 1564, 1514, 1481, 1448, 1355, 1296, 1260, 1215, 1154, 1126, 1092, 1032, 898, 852, 802, 754, 730, 688, 644 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{19}H_{19}N_3OF$, 324.1512; found, 324.1512.

*N-(1-Methyl-4-(4-(trifluoromethyl)benzyl)-1,3-dihydro-2H-imidazol-2-ylidene)benzamide (**4s**).* Prepared via NaH-mediated cyclization of **3s** in DMF at 60 °C with flash chromatography purification eluting with 6:4 hexanes/EtOAc to yield a foamy white oil (802 mg, 71% yield). R_f = 0.19 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.23 (d, J = 7.5 Hz, 2H), 7.53 (d, J = 8.0 Hz, 2H), 7.47−7.36 (m, 3H), 7.27−7.24 (m, 2H), 6.22 (s, 1H), 3.84 (s, 2H), 3.53 (s, 3H) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ 173.7, 149.9, 141.5, 137.8, 131.1, 129.5 (q, J_{CF} = 30.4 Hz), 129.1, 128.9, 128.1, 125.8 (q, J_{CF} = 2.1 Hz), 124.3 (q, J_{CF} = 272.0 Hz), 113.2, 32.1, 31.9 ppm. IR (thin film): 1570, 1558, 1367, 1352, 1160, 1106, 1065 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{19}H_{17}N_3OF_3$, 360.1324; found, 360.1323.

*N-(1-Benzyl-4-methyl-1,3-dihydro-2H-imidazol-2-ylidene)-benzamide (**4t**).* Prepared via NaH-mediated cyclization of **3t** in DMF at 60 °C as a colorless foam (82.4 mg, 52%). R_f = 0.19 (6:4 hexanes/EtOAc). ^{1}H NMR ($CDCl_3$, 500 MHz): δ 8.30 (d, J = 8.0 Hz, 2H), 7.45−7.30 (m, 8H), 6.17 (s, 1H), 5.17 (s, 2H), 2.14 (s, 3H) ppm. ^{13}C ($CDCl_3$, 125 MHz): δ 174.9, 151.1, 138.8, 136.5, 130.8, 129.1 (2), 128.4, 128.0, 121.1, 110.0, 95.0, 48.1, 11.0 ppm. IR (thin film): 3219, 1629, 1590, 1567, 1544, 1496, 1488, 1471, 1455, 1381, 1349, 1300, 1138, 1024 cm^{-1}. HRMS (ESI-TOF) [M + H]$^+$ m/z: calcd for $C_{18}H_{18}N_3O$, 292.1450; found, 292.1451.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available free of charge on the ACS Publications website at DOI: 10.1021/acs.joc.7b00639.

X-ray crystal structure data for **4m** (CIF)

Copies of ^{1}H NMR and ^{13}C NMR spectra for all new compounds (PDF)

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Notes

The authors declare the following competing financial interest(s): R.E.L. has an equity position in Curza Global LLC.

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