



## DEPARTMENT OF HEALTH AND HUMAN SERVICES

### National Institutes of Health

#### Government-Owned Inventions; Availability for Licensing

**AGENCY:** National Institutes of Health, HHS.

**ACTION:** Notice.

**SUMMARY:** The inventions listed below are owned by an agency of the U.S.

Government and are available for licensing in the U.S. to achieve expeditious commercialization of results of federally-funded research and development.

**FOR FURTHER INFORMATION CONTACT:** Licensing information may be obtained by contacting Michael Shmilovich, Esq, MS, CLP; 301-435-5019;

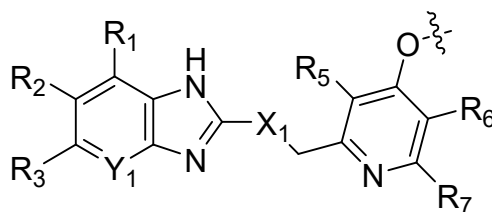
[michael.shmilovich@nih.gov](mailto:michael.shmilovich@nih.gov), at the National Heart, Lung, and Blood, Office of

Technology Transfer and Development Office of Technology Transfer, 31 Center Drive Room 4A29, MSC2479, Bethesda, MD 20892-2479. A signed Confidential Disclosure Agreement may be required to receive any unpublished information.

**SUPPLEMENTARY INFORMATION:** This notice is in accordance with 35 U.S.C. 209 and 37 CFR part 404. Technology description follows. Prazole-Based Antiviral Therapeutics:

Available for licensing and commercial development is a patent estate that covers prazole based compounds and their methods of use as antiviral therapeutics. Prazoles are benzimidazole derivatives generally marketed as stomach-acid reducers, owing to their ability to inhibit the H<sup>+</sup>/K<sup>+</sup> ATPases (proton pumps) of the parietal cells in the stomach epithelium. Prazoles can inhibit the egress of several viral targets: HIV-1, HSV-1 and -2, MAYV, and EBV by interfering with the ESCRT complex in the formation of exosomes. In that respect, the target for inhibition of these viruses is Tumor susceptibility gene 101 (Tsg101), a member of the ESCRT-I complex. The N-terminal ubiquitin E2 variant

(UEV) domain of Tsg101 has both ubiquitin and P[T/S]AP motif binding sites, where the prazole binds to C73 in the middle of the ubiquitin-binding site, sterically inhibiting the Ub-Tsg101 interaction. By way of example, and not limitation, a prazole compound according to this invention can take on the follow core structure:



Where L is optionally present and is a C<sub>1</sub>-C<sub>6</sub> alkyl group, a C<sub>1</sub>-C<sub>6</sub> alkoxy group, a -(CH<sub>2</sub>CH<sub>2</sub>O)<sub>n</sub>- group where n is an integer from 1 to 6, a phenyl group, or a benzyl group, each of which is optionally substituted. B is a substituted or unsubstituted aromatic or heteroaromatic substituent, and where

X<sub>1</sub> is S(=O) or S;

Y<sub>1</sub> is N or CR<sub>4</sub>; and

each of R<sub>1</sub>-R<sub>7</sub> is independently selected from hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, perfluoro C<sub>1</sub>-C<sub>6</sub> alkyl, perfluoro C<sub>1</sub>-C<sub>6</sub> alkoxy, halo, -CN, -OH, -COOR<sub>8</sub>, substituted or unsubstituted aromatic, or substituted or unsubstituted heteroaromatic, and each R<sub>8</sub> independently is hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, phenyl, or benzyl.

### Potential Commercial Applications:

- antivirals
- therapeutics
- ESCRT complex formation
- prazole
- antifungal

### Development Stage:

- Early stage

**Inventors:** Nico Tjandra (NHLBI), Carol Carter (Stonybrook), Rolf E. Swenson (NHLBI), David Nyenhuis (NHLBI), Natarajan Raju (NHLBI), Chandra Mushti, (NHLBI), and Venkata Sabbasani (NHLBI).

**Intellectual Property:** HHS Reference No. E-239-2023-0; U.S. Provisional Patent Application No. 63/545,080 filed October 20, 2023.

**Publication:** D. A. Nyenhuis, S. Watanabe, R. Bernstein, R. E. Swenson, N. Raju, V. R. Sabbasani, C. Mushti, D.-Y. Lee, C. Carter, N. Tjandra, “Structural Relationships to Efficacy for Prazole-Derived Antivirals.” *Adv. Sci.* 2024, 2308312.

<https://doi.org/10.1002/advs.202308312>

**Licensing Contact:** Michael Shmilovich, Esq, MS, CLP; 301-435-5019;  
michael.shmilovich@nih.gov

Dated: April 2, 2024.

**Michael A. Shmilovich,**

*Senior Licensing and Patenting Manager,*

*National Heart, Lung, and Blood Institute,*

*Office of Technology Transfer and Development.*

[FR Doc. 2024-07278 Filed: 4/4/2024 8:45 am; Publication Date: 4/5/2024]