

VOLUME 275 • NUMBER 1 • OCTOBER 1995

JPETAB 275 (1) 1-527 (1995)

ISSN 0022-3565

275

JOL

The Journal of

PHARMACOLOGY

AND EXPERIMENTAL THERAPEUTICS

*A Publication of The American Society
for Pharmacology and Experimental Therapeutics
Founded by John J. Abel—1909*

MARIE SMITH SCHWARTZ MEDICAL LIBRARY
BROOKDALE HOSPITAL MEDICAL CENTER

Edited for the Society by John A. Harvey

1995

OCT 26 1995

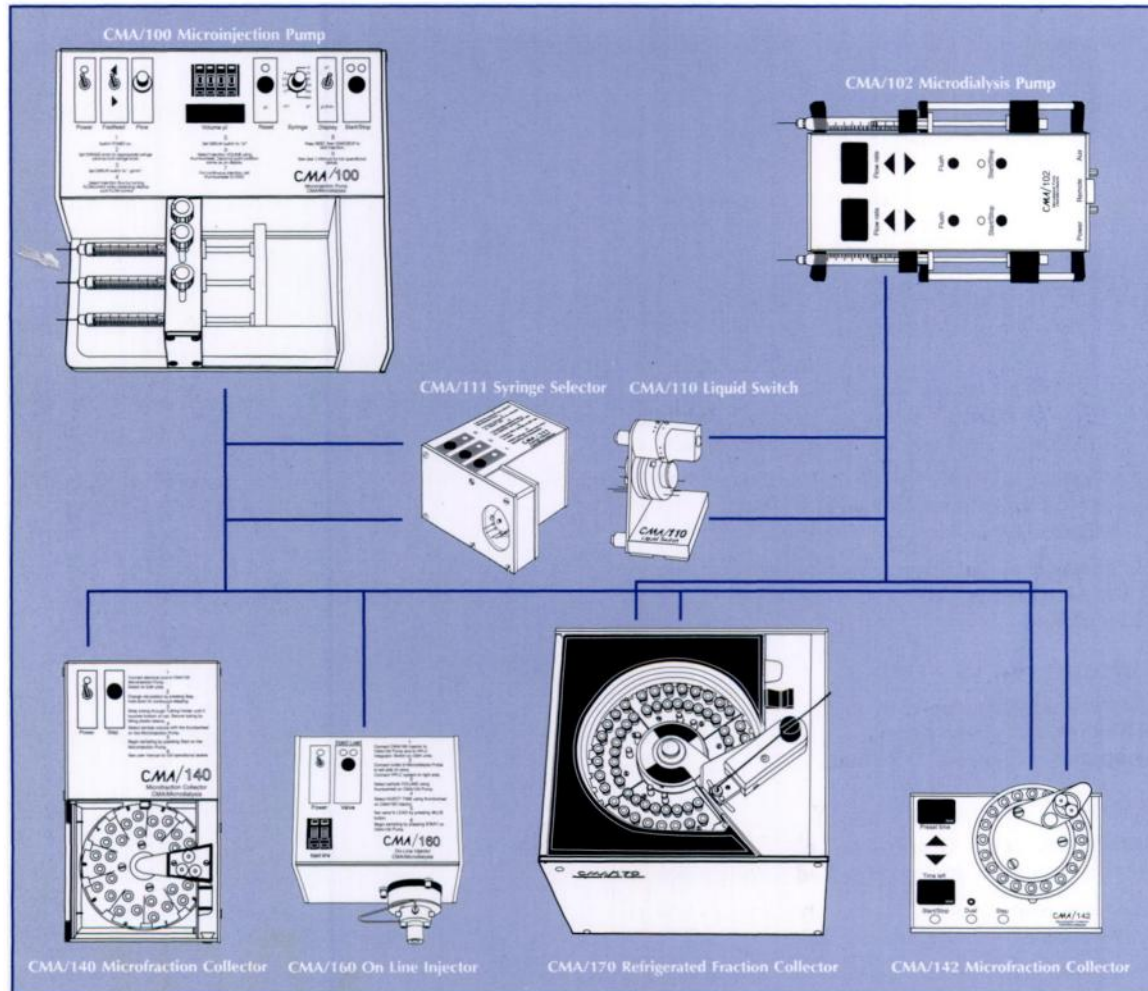


Published by Williams & Wilkins



MICRODIALYSIS INSTRUMENTS

- Basic, cost-effective and advanced, computer-controlled systems
- Precision pumps, liquid switches, probes and microfraction collectors
- Application Notes, Microdialysis Training Courses and Instrument Service



Our shelves are fully stocked with the complete line of Microdialysis equipment and supplies.
In fact most probes and accessories are available to be shipped to you overnight.
Build or update your microdialysis system to suit your individual needs.

If your future plans include the expansion of microdialysis capabilities,
or need for Technical Support or Instrument Service

Call Toll-free: (800) 440-4980

or send us a fax today!

CMA *Microdialysis*

This One



QA8D-LHL-XLBT

COPYRIGHT © 1995 BY THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

INFORMATION FOR SUBSCRIBERS

THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS (ISSN 0022-3565) is an official publication of The American Society for Pharmacology and Experimental Therapeutics and is published by Williams & Wilkins, 351 West Camden Street, Baltimore, MD 21201-2436. Second class postage paid at Baltimore, MD and at additional mailing offices. POSTMASTER: Send address changes to THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS, 351 West Camden Street, Baltimore, MD 21201-2436.

Frequency: *Monthly*: Four volumes a year beginning in January, April, July, and October.

Correspondence concerning business matters should be addressed to: Customer Service, Subscriptions, Williams & Wilkins, 351 West Camden Street, Baltimore, MD 21201-2436. Telephone 1-(800) 638-6423 from anywhere in the U.S. and Canada. From other countries, call (410) 528-8555. Fax: (410) 528-8596.

Correspondence regarding editorial matters should be addressed to the Editor: John A. Harvey, Ph.D., Chief, Division of Behavioral Neurobiology, Department of Pharmacology, The Medical College of PA at EPPI, 3200 Henry Avenue—Suite 129, Philadelphia, PA 19129. Telephone: (215) 842-4061 Fax: (215) 843-0690. E-mail: JPET@MEDCOLPA.EDU.

For information on Society membership, contact: The American Society for Pharmacology and Experimental Therapeutics, 9650 Rockville Pike, Bethesda, MD 20814. Telephone (301) 530-7060 Fax: (301) 530-7061.

Instructions to Authors appears in the first issue of each volume (January, April, July, October).

Annual Subscription Rates: U.S.: *Personal* \$190.00; *Institutional* \$370.00; *Single copy* \$33.00. **Outside the U.S., except for Japan:** *Personal* \$265.00; *Institutional* \$445.00; *Single copy* \$39.00.

Institutional (multiple reader) rate applies to libraries, schools, hospitals, clinics, group practices, and federal, commercial and private institutions and organizations.

For Japanese rates, please contact: Igaku-Shoin MYW Ltd., 3-23-14 Hongo, Bunkyo-Ku, Tokyo 113, JAPAN. Telephone: (03) 5689-5400 or 5401. Fax: (03) 5689-5402.

PRICES ARE SUBJECT TO CHANGE.

The GST number for Canadian subscribers is 123394371. Country of origin USA.

New subscriptions received before May 1st of each year will begin with the first issue of the year. Subscriptions received between May 1st and October 31st will start with the mid-year issue (July). Subscriptions received after October 31st will start with the first issue of the following year. Subscriptions may start with any current volume's issue upon request.

Renewals should be done *promptly* to avoid a break in journal

delivery. The Publisher cannot guarantee to supply back issues on late renewals.

Change of address: The publisher must be notified 60 days in advance. Journals undeliverable because of incorrect address will be destroyed. Duplicate copies may be obtained, if available, from the Publisher at the regular price of a single issue. Send address changes to THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS, 351 West Camden Street, Baltimore, MD 21201-2436. **If a member, please contact the Society with your change.**

Reprints of individual articles are available only from the authors.

Reprints in large quantities, for commercial or academic use, may be purchased from the Publisher. For information and prices call (410) 528-4292.

Microfilm and Microfiche: Prices are available upon request. Microfilm editions may be ordered from Williams & Wilkins.

The Journal subscription list is available for rental on a controlled basis from Williams & Wilkins. All promotional literature must be approved in advance.

Disclaimer: The statements and opinions contained in the articles of THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS are solely those of the individual authors and contributors and not of the American Society for Pharmacology and Experimental Therapeutics or Williams & Wilkins. The appearance of advertisements in the Journal is not a warranty, endorsement or approval of the products or safety. The American Society for Pharmacology and Experimental Therapeutics and the Publisher disclaim responsibility for any injury to persons or property resulting from any ideas or products referred to in the articles or advertisements.

Volume indices appear in the March, June, September, and December issues.

Indexing/Abstracting Services: The Journal is currently included by the following services in print and/or electronic format: *Index Medicus*, *Current Contents (Life Sciences)*, *Science Citation Index*, *Research Alert [personalized search service]*, *ISI/BioMed [on-line database]*, *Excerpta Medica*, and *Bio-science Information Service*, and *Reference Update/Research Information Systems*.

Copyright Information: THE JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS is copyrighted by the American Society for Pharmacology and Experimental Therapeutics. No portion(s) of the work(s) may be reproduced without written consent from Williams & Wilkins. Permission to reproduce copies of articles for non-commercial use may be obtained from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (508) 750-8400, with a fee of \$3.00 per copy.

Copyright © 1995 by the American Society of Pharmacology and Experimental Therapeutics.

AUTHOR INDEX

- Aasmundstad, T. A., 435
 Aizawa, T., 194
 Allcock, G. H., 120
 Anglin, C. P., 368
 Ator, N. A., 183
 Aviv, A., 215
 Azuma, Y., 450
 Babovic-Vuksanovic, D., 150
 Badger, T., 79
 Balster, R. L., 1
 Battistini, B., 120
 Bauer, R. F., 368
 Bellgowan, P. S. F., 381
 Bennett, G. J., 177
 Benvenga, M. J., 164
 Böhlen, P., 456
 Borgeat, P., 312
 Borsini, F., 358
 Boucrot, P., 171
 Boulay, G., 312
 Bowyer, J. F., 325
 Broening, H. W., 325
 Brooks, D. P., 200
 Burnstock, G., 422
 Butelman, E. R., 374
 Cahill, C. M., 84
 Ceci, A., 358
 Chen, J., 509
 Cheng, P. Y., 334
 Chiodo, L. A., 412
 Chiou, G. C. Y., 474
 Christiansen, I., 38
 Ciabattoni, G., 94
 Collins, P. W., 368
 Cooke, M. E., 462
 Coy, D. H., 285
 Créminon, C., 94
 Crooke, R. M., 462
 Crooke, S. T., 462
 Cuadra, G., 228
 Danhof, M., 245
 Dement, W. C., 263
 de Waele, J.-P., 518
 Dirig, D. M., 219
 Doods, H. N., 136, 143
 Eberlein, W., 136, 143
 Edgar, D. M., 263
 Elliott, J. D., 200
 Engel, W., 136, 143
 Entzeroth, M., 136, 143
 Fekete, Z., 215
 Fernández, E., 442
 Fischman, M. W., 38
 FitzGerald, G. A., 94
 Fletcher, T., 200
 Foltin, R. W., 38
 Fournier, A., 120
 France, C. P., 374
 Francis, R., 345
 Freeman, A. S., 412
 Fujita, A., 429
 Gagarella, T. S., 368
 Galán, A. I., 442
 Gasiiecki, A. W., 368
 Gekle, M., 397
 Gellai, M., 200
 Giacobini, E., 228
 Gianoulakis, C., 518
 González-Buitrago, J. M., 442
 Goodman, M., 63
 Graham, M. J., 462
 Green, P. G., 502
 Guanowsky, V., 101
 Gubbens-Stibbe, J. M., 245
 Guillemette, G., 312
 Haeggström, J. Z., 31
 Hammond, D. L., 274
 Harkin, C. P., 127
 Hartsell, T. L., 479
 Hashizume, K., 194
 Hata, F., 429
 Hayashi, T., 207
 Heidbreder, C. A., 150
 Helmstetter, F. J., 381
 Hettrick, D. A., 127
 Heym, J., 101
 Hidaka, H., 194
 Hirai, M., 73
 Hong, K. W., 340
 Hong, S.-J., 474
 Hori, R., 73
 Hossain, M. A., 237
 Howard, H. R., 101
 IJzerman, A. P., 245
 Imamura, Y., 177
 Ingelman-Sundberg, M., 79
 Inui, K.-I., 73
 Ishihara, F., 194
 Ishii, T., 429
 Itoh, N., 194
 Jacobson, K. A., 245
 Jenck, F., 405
 Jensen, R. T., 285
 Jiménez, R., 442
 Johnson, K. M., 7, 14
 Jones, P. H., 368
 Jugus, M., 200
 Kaasjager, K. A. H., 306
 Kagaya, A., 207
 Kakehi, Y., 73
 Kanatani, H., 450
 Keith, R. H., 368
 Kelland, M. D., 412
 Kiianmaa, K., 518
 Kim, C. D., 340
 Kimura, M., 215
 King, P. D., 296
 Kinoshita, M., 494
 Kiyoki, M., 450
 Kobuchi, H., 194
 Koivusalo, M., 79
 Kojima, S., 254
 Komano, T., 73
 Koomans, H. A., 306
 Koshihara, Y., 450
 Kruszyna, H., 48
 Kuhn, C., 345
 Kume, E., 494
 Kusstatscher, S., 456
 Lang, F., 171
 Laviola, G., 345
 Lawson, J., 94
 Leander, J. D., 164
 Lebel, L. A., 101
 Lee, V. H. L., 114
 Levin, F. R., 38
 Levine, J. D., 502
 Lin, J.-T., 285
 Lindros, K. O., 79
 Lonart, G., 7, 14
 Lowe, J. A., 1
 Lowe, J. A., III, 101
 Luxon, B. A., 296
 Maclouf, J., 94
 Malmberg, A. B., 63
 Mameya, S.-i., 319
 Mantey, S. A., 285
 Martin, B. R., 1
 Martin, J. R., 405
 Martinez, A. J., 479
 Martínez, V., 486
 Mathôt, R. A. A., 245
 Maze, M., 263
 McGowan, M. K., 274
 McLarnon, J. G., 389
 McLean, S., 101
 Morán, D., 442
 Morana, S. J., 48
 Moreau, J.-L., 405
 Mørland, J., 435
 Motohashi, N., 207
 Munoz, B., 31
 Muñoz, M. E., 442
 Nagasawa, T., 194
 Nakabayashi, T., 194
 Nambi, P., 200
 Nishio, H., 429
 Ohkubo, Y., 23
 Ohlstein, E. H., 200
 Ohta, T., 450
 Ornstein, P. L., 164
 Pagel, P. S., 127
 Parmley, W. W., 254
 Patrono, C., 94
 Paulsen, R. E., 435
 Perkins, W. E., 368
 Peroutka, S. J., 502
 Petit, J.-Y., 171
 Pierce, P. A., 502
 Pitts, D. K., 412
 Pollock, C. A., 397
 Poore, L. H., 381
 Prié, S., 312
 Rabelink, T. J., 306
 Rasenick, M. M., 509
 Ritke, M. K., 479
 Ro, S., 63
 Robert, J.-M., 171
 Rochelle, L. G., 48
 Rodríguez-Membrilla, A., 486
 Ronis, M., 79
 Rubino, A., 422
 Rudolf, K., 136, 143
 Russell, M. A., 48
 Samuelsson, B., 31
 Sandor, Z., 456
 Sannerud, C. A., 183
 Sato, Y., 194
 Sawa, T., 319
 Sawynok, J., 84
 Schiller, P., 63
 Schmidt, A. W., 101
 Schor, N. F., 479
 Schulz, D. W., 101
 Seddon, A., 456
 Seeger, T. F., 101
 Seidel, W. F., 263
 Seymour, P. A., 101
 Shimizu, M., 207
 Shimizu, T., 73
 Shippenberg, T. S., 150
 Shoaib, M., 150
 Silbernagl, S., 397
 Sirois, P., 312
 Slikker, W., Jr., 325
 Smith, R. P., 48
 Soong, Y., 334
 Soudijn, W., 245
 Spealman, R. D., 53
 Spear, L. P., 345
 Szabo, S., 456
 Szeto, H. H., 334
 Taguchi, N., 194
 Takebayashi, M., 207
 Takeshita, N., 23
 Takeuchi, T., 429
 Tamaki, H., 494
 Tanaka, K., 73
 Tanigawara, Y., 73
 Taniyama, K., 319
 Thomas, D. A., 274
 Tsai, B. S., 368
 Uchitomi, Y., 207
 Ueda, K., 73
 Vane, J. R., 120
 van Rijn, H. J. M., 306
 Vergara, P., 486
 Volonté, M., 358
 Walsh, R. E., 368
 Wang, L., 412
 Wang, Z., 94
 Wartier, D. C., 127
 Warner, T. D., 120
 Weiner, N., 237
 Welin, L., 171
 Wetterholm, A., 31
 White, T. D., 84
 Wieland, H. A., 136, 143

Wienen, W., 136, 143
Wikman-Coffelt, J., 254
Wilcox, D. E., 48
Wiley, J. L., 1
Willim, K. D., 143
Wong, C.-H., 31

Wood, R. D., 345
Woods, J. H., 374
Wu, D.-l., 334
Wu, S. T., 254
Xie, G.-X., 502
Xu, R., 389

Yaksh, T. L., 63, 219
Yalowich, J. C., 479
Yamaguchi, I., 23
Yamawaki, S., 207
Yang, X. Y., 215

Yasuhara, M., 73
Yen, W.-C., 114
Yoshida, O., 73
Yuan, W., 31
Zorn, S. H., 101