

# Index

## Pharmacological Reviews

Volume 38

1986

- Abdel-Latif, A. A. Calcium-mobilizing receptors, polyphosphoinositides, and the generation of second messengers, 227
- Acetylcholine, calcium antagonism and calcium entry blockade, 337
- Adenohypophysis, calcium antagonism and calcium entry blockers, 360
- Adenosine triphosphatase  
cellular effects of cannabinoids, 67  
effects of cannabinoids (table), 48
- Adenylate cyclase  
cAMP levels and, effects of cannabinoids (table), 49  
effects of cannabinoids, 48
- Adrenergic agents, effect on airway secretion, 281
- Adrenoceptors, *alpha*, calcium antagonism and calcium entry blockade, 383
- Afferents, neuropharmacology of capsaicin, 188
- Agurell, Stig, Magnus Halldin, Jan-Erik Lindgren, Agneta Ohlsson, Marianne Widman, Hamp Gillespie, and Leo Hollister. Pharmacokinetics and metabolism of  $\Delta^1$ -tetrahydrocannabinol and other cannabinoids with emphasis on man, 21
- AIDS, health aspects of cannabis, 3
- Airplane flying, health aspects of cannabis, 12
- Airway  
effects of air pollutants, 279  
pharmacology of secretion, 273  
surface epithelium, secretory physiology, 278
- Alcohol, health aspects of cannabis, 7
- Alkalosis, calcium antagonism and calcium entry blockade, 337
- Amino acids  
helical wheel diagrams, calcitonin (fig.), 308  
sequences in calcitonin homologues (fig.), 307  
sequences of  $\beta$ -endorphin (fig.), 295
- AMP, cyclic  
adenylate cyclase and, effects of cannabinoids (table), 49  
effect of phosphodiesterase inhibitors, airway secretion, 283
- Analgesia  
characterization of  $\beta$ -endorphin, 304  
health aspects of cannabis, 14  
neuropharmacology of capsaicin, 183, 187  
time courses of effects,  $\beta$ -endorphin (fig.), 305
- Anesthesia, neuropharmacology of capsaicin, 204
- Angina pectoris, calcium antagonism and calcium entry blockade, 389
- Anoxia, calcium antagonism and calcium entry blockade, 337
- Antiasthmatics, cellular effects of cannabinoids, 68
- Anticonvulsants  
cannabinoids, 77, 171  
cellular effects of cannabinoids, 66  
health aspects of cannabis, 15
- Antiemetics  
cancer chemotherapy patients, health aspects of cannabis, 13  
cannabinoid pharmacology, 171
- Antiglaucoma agents, cellular effects of cannabinoids, 68
- Anti-inflammatory agents, cannabinoid pharmacology, 171
- Antinociception, cannabinoid pharmacology, 170
- Aorta  
calcium entry blockers, 326  
differences between rat and rabbit, calcium antagonism, calcium entry blockers (fig.), 330
- Arachidonic acid  
biosynthesis (fig.), 54  
calcium-mobilizing receptors, 251  
examples of tissue, AA liberation or prostaglandin release (table), 252  
release from phosphoinositides (fig.), 252
- Arrhythmias  
calcium antagonists, 388  
experimental, 354
- Asthma, health aspects of cannabis, 15
- Automobile driving, health aspects of cannabis, 12
- Bacteria, effect on airway secretion, 279
- Basophils, calcium role, 364
- Behavior  
aggressiveness, cannabinoid pharmacology, 155  
cannabinoid pharmacology, 153  
effects of cannabinoids (table), 78  
hashish use, health aspects of cannabis, 3  
lipophilicity of cannabinoids, 63  
pharmacology, 156
- Benzopyran, compared with THC ring systems (fig.), 82
- Bepidil, cardiac tissue effect, 350
- Blood plasma  
measurement of tetrahydrocannabinol, 23  
profile, smoking and injection of THC, 40
- Brain  
accumulation of cannabis, 11  
calcium antagonism and calcium entry blockers, 359  
hashish use, health aspects of cannabis, 3  
neurotransmitter release, calcium entry blockers, 357
- Buck, Stephen H., and Thomas F. Burks. The neuropharmacology of capsaicin: Review of some recent observations, 179
- Burks, Thomas F. See Buck and Burks, 179
- Calcitonin  
amino acid sequences in naturally occurring homologues (fig.), 307  
CGRP and, characterization of  $\beta$ -endorphin, 306  
helical wheel diagrams, amino acid residue side chains (fig.), 308
- Calcium  
agonist- and depolarization-induced contractions in aorta (table), 331  
antagonism and calcium entry blockade, 324  
antagonists, clinical applications (table), 389  
calcium ionophores and, effect on airway secretion, 283  
channel receptor sites (fig.), 376  
channels, voltage-dependent, 379  
entry blockers (fig.), 325  
effect on aorta (fig.), 330  
mechanism of action, 367  
nitrendipine binding (fig.), 371  
selectivity, 385

- Calcium—*continued*  
influx in resistance vessels (table), 339  
ion regulation in cell, polyphosphoinositides (fig.), 234  
IP<sub>3</sub>-induced release (table), 246  
mobilizing receptors, polyphosphoinositides, generation of second messengers, 227  
modulators (table), 325  
plasma membrane functions, 241  
Calmodulin, calcium antagonism and calcium entry blockade, 382  
Cancer, chemotherapy, health aspects of cannabis, 13  
Cannabinoid antagonists  
design, 57  
evaluation of analogs (fig.), 58  
receptors, 56  
Cannabinoids  
cellular effects, 45  
compared with steroid structures (fig.), 61  
effects on miscellaneous enzymes (table), 51  
effects on prostaglandins (table), 53  
heterocyclic and aminocarbocyclic structures (fig.), 58  
in man (table), 84  
mean plasma curve of CBD (fig.), 32  
metabolism of CBD and CBN, 39  
pharmacokinetics of CBD and CBN in man, 32  
pharmacology, 151  
smoking and injection (fig.), 33  
structure-activity relationships, 75  
structure of CBD metabolites (table), 39, 40  
tetrahydrocannabinol  
effects on activity and rectal temperature, mice (table), 81  
pharmacokinetics, emphasis on man, 21  
Cannabis, health aspects, 1  
Capsaicin  
anesthesia and pyrexia, 204  
cardiovascular function, 211  
chemical structure (fig.), 180  
gastrointestinal function, 209  
muscle reflexes, 205  
neuropharmacology, 179  
ocular function, 207  
reports of substance P depletion (table), 181  
sensory specificity, 217  
therapeutic implications, 220  
thermoregulation, 200  
visceral reflexes, 205  
Cardiac tissues  
action potentials (fig.), 349  
calcium antagonism and calcium entry blockade, 347  
Cardiovascular system  
cannabinoid pharmacology, 167  
neuropharmacology of capsaicin, 211  
Cascade, pharmacotherapeutic (table), 390  
Cell metabolism, health aspects of cannabis, 5  
Central nervous system  
capsaicin  
neuronal plasticity, 189  
neuronal specificity, 216  
neuropharmacology, 185  
therapeutic implications, 220  
Cerebral arteries, calcium antagonism and calcium entry blockade, 332  
Chemotherapy, cancer, health aspects of cannabis, 13  
Cholinergic agents, effect on airway secretion, 280  
Cholinergic systems, cannabinoid pharmacology, 163  
Cinnarizine, effect on calcium-evoked contractions (fig.), 326  
Coronary artery  
calcium antagonism and calcium entry blockade, 334  
nifedipine  
concentration-effect curves (fig.), 386  
effect (fig.), 391  
Cyclic AMP. *See* AMP, cyclic  
Dewey, William L. Cannabinoid pharmacology, 151  
1,2-Diacylglycerol, inositol 1,4,5-trisphosphate and, synergistic interactions, 254  
Diacylglycerols, protein kinase C, 248  
Dibenzopyran, numbering system for metabolites, confusion, monoterpene method, 21  
Dihydropyridine  
binding, chemical properties, 374  
dissociation constants in membranes (table), 368  
drugs resembling diltiazem (table), 373  
effect of diltiazem (table), 372  
effect on phenylalkylamine binding, 373  
mechanisms of action, calcium entry blockers, 367  
stereoselectivity of binding (table), 369  
Diltiazem  
binding, 370  
calcium channel receptor sites (fig.), 376  
effect of ischemia, 352  
effect on phenylalkylamine binding, 373  
effects on dihydropyridine binding, 371  
Diphenylpiperazines  
diltiazem binding, 374  
effects on dihydropyridine binding, 372  
verapamil, 374  
Diuretic agents, effect on airway secretion, 285  
Drugs  
cannabis use, health aspects, 2  
delivery, cannabinoid vehicle, 152  
dependence, cannabinoid pharmacology, 160  
development, cannabinoids, 77  
glossary of chemical names (table), 393  
interactions, cannabinoid pharmacology, 165  
Endocrine systems, cannabinoid pharmacology, 169  
Endocrine tissues, calcium antagonism and calcium entry blockers, 359, 361  
Endoplasmic reticulum, IP<sub>3</sub>-induced calcium release, 246  
 $\beta$ -Endorphin  
binding potencies to opiate receptors (table), 300  
helical net diagrams (fig.), 297  
opiate antagonists (table), 302  
physicochemical properties (table), 298  
resistance to enzyme activation (table), 299  
structural characterization, 291  
Enzymes  
cellular effects of cannabinoids, 65, 67  
effects of cannabinoids (table), 51  
inactivation  
 $\beta$ -endorphin, 298  
 $\beta$ -endorphin (table), 299  
Epithelium, airway, pharmacology of secretion, 274  
Erythrocytes, calcium role, 364  
Estradiol, compared with cannabinoid structures (fig.), 61  
Exocrine tissues, calcium role, 366  
Eye, health aspects of cannabis, 10  
Feces, excretion of tetrahydrocannabinol metabolites, 37  
Fetus, health aspects of maternal use of cannabis, 4  
Flunarizine, effect of protein concentration in assay medium, nitrendipine binding (fig.), 373  
Food intake  
cannabinoid pharmacology, 170  
neuropharmacology of capsaicin, 215

- Gastric mucosa, calcium role, 367  
 Gastrointestinal tract, neuropharmacology of capsaicin, 209  
 Gillespie, Hamp. *See* Agurell et al., 21  
 Glandular cells, pharmacology of airway secretion, 277  
 Glaucoma, health aspects of cannabis, 14  
 Glucagon  
   amino acid sequences (fig.), 311  
   characterization of  $\beta$ -endorphin, 310  
   helical net diagram (fig.), 311  
 Godfraind, Theophile, Robert Miller, and Maurice Wibo. Calcium antagonism and calcium entry blockade, 321  
 GTP-binding, receptors, polyphosphoinositides and second messengers (fig.), 243
- Halldin, Magnus. *See* Agurell et al., 21  
 Heart  
   correlation between binding and inotropic effect (table), 378  
   health aspects of cannabis, 10  
   noradrenergic transmission, calcium antagonism and calcium entry blockers, 356  
 Histamine, effect on airway secretion, 284  
 Hollister, Leo E. Health aspects of cannabis, 1  
 Hollister, Leo. *See* Agurell et al., 21  
 Hormones  
   amphiphilic peptide, characterization of  $\beta$ -endorphin, 313  
    $\beta$ -endorphin, structural characterization, 291  
 Hypertension, calcium antagonism and calcium entry blockade, 389  
 Hypoxia, health aspects of cannabis, 3
- Immune response, health aspects of cannabis, 3  
 Inositol phosphates, extraction and analysis, 236  
 Inositol 1,4,5-trisphosphate, 1,2-diacylglycerol and, synergistic interactions, 254  
 Insomnia, health aspects of cannabis, 15
- Kaiser, Emil Thomas. *See* Taylor and Kaiser, 291  
 Kidney  
   juxtaglomerular cells, 362  
   tubules, calcium entry blockers, 367
- Leukotrienes, prostaglandins and, 67  
 Lidoflazine, treatment of ischemic heart disease, 353  
 Ligand-receptor binding, neuropharmacology of capsaicin, 190  
 Lindgren, Jan-Erik. *See* Agurell et al., 21  
 Lithium, polyphosphoinositide response, 237  
 Liver, metabolites of tetrahydrocannabinol (table), 37  
 Lung  
   health aspects of cannabis, 10  
   method of smoking cannabis, metabolism of tetrahydrocannabinol, 23  
   pharmacology of airway secretion, 273  
 Lymphocytes, calcium antagonism and calcium entry blockade, 364
- Macromolecules, metabolism, effects of cannabinoids, 50  
 Marijuana  
   chemical entities, 152  
   health aspects of cannabis, 15  
   smoking, health aspects of cannabis, 2  
   structure-activity relationships, cannabinoids, 75  
 Marin, Matthew G. Pharmacology of airway secretion, 273  
 Martin, Billy R. Cellular effects of cannabinoids, 45  
 Mast cells, calcium role, 363  
 Membrane  
   cellular effects of cannabinoids, 46, 67  
   lipophilicity of cannabinoids, 63  
   plasma, polyphosphoinositides, 241  
   potential, calcium antagonism and calcium entry blockade, 338
- Metabolites  
   tetrahydrocannabinol  
     active metabolite theory, 31  
     excretion in urine and feces, 37  
     formed by livers (table), 37  
     found in man, 35  
     psychoactivity, 37  
 Methionine-enkephalin, characterization of  $\beta$ -endorphin, 301  
 Miller, Robert. *See* Godfraind et al., 321  
 Monoterpene, numbering system for metabolites, confusion, dibenzopyran method, 21  
 Muscle relaxants, health aspects of cannabis, 15  
 Muscle, skeletal  
   calcium entry blockers, 357  
   release of calcium, 365  
 Muscle, smooth  
   assays, opioid activities, 301  
   calcium entry blockers, 356  
   correlation between binding and pharmacological activity, 377  
   intestinal  
     calcium entry blockers, 357  
     density distribution histograms (fig.), 374  
   nonvascular  
     calcium antagonism and calcium entry blockade, 340  
     IC<sub>50</sub> or RC<sub>50</sub> values of calcium entry blockers (table), 341  
     pA<sub>2</sub> values, intestine (table), 342  
   polyphosphoinositide cycle, 255, scheme showing synergism, 256  
   respiratory  
     calcium antagonism and calcium entry blockade, 343  
     Log IC<sub>50</sub> values (table), 345  
   vascular, calcium entry blockers, 326  
 Myo-inositol polyphosphates  
   scheme showing suggested pathways, 248  
   structures (fig.), 247
- Neonates, neuropharmacology of capsaicin, 185, 218  
 Nerves, neuropharmacology of capsaicin, 193  
 Nervous tissues  
   calcium antagonism and calcium entry blockers, 355  
   calcium antagonism and calcium entry blockade, 379  
 Neurochemistry, cannabinoid pharmacology, 161  
 Neurons, neuropharmacology of capsaicin, 193  
 Neuropharmacology, capsaicin, 179  
 Neurophysiology, cannabinoid pharmacology, 164  
 Neurotransmitters,  $\beta$ -endorphin, related peptide hormones and, 291  
 Neutrophils, calcium role, 364  
 Nifedipine  
   concentration-effect curves, coronary artery (fig.), 386  
   effect on calcium-evoked contractions (fig.), 327  
   effect on coronary artery (fig.), 391  
   negative inotropic action (fig.), 380  
   protection from ischemia, 353  
   verapamil and, effect on slow action potentials (fig.), 349  
 Nitrendipine  
   binding, effect of protein concentration in assay medium (fig.), 373  
   calcium entry blockers effect on binding (fig.), 371  
   inhibition of binding by verapamil (fig.), 371  
   number of binding sites, membrane preparations (table), 368  
 Numbering systems  
   monoterpene and dibenzopyran  
     cannabinoids (fig.), 76  
     confusion, metabolites, 21  
     tetrahydrocannabinol (fig.), 22
- Ohlsson, Agneta. *See* Agurell et al., 21  
 Opiate antagonists,  $\beta$ -endorphin and peptides 1-6 (table), 302  
 Ouabain, effect on airway secretion, 285  
 Ovary, Leydig cells, 362

- Pacemakers, conduction, 350
- Paraquat, contamination of cannabis, health aspects, 11
- Parathyroid, thyroid and, calcium antagonism and calcium entry blockade, 362
- Parenchyma, calcium antagonism and calcium entry blockade, 346
- Peptides
- calcitonin gene-related, helical net diagram (fig.), 310
  - future models of  $\beta$ -endorphin, 306
  - histidine isoleucine, helical net diagram (fig.), 313
  - models
    - amino acid sequences (fig.), 296
    - $\beta$ -endorphin, 294
  - opiate antagonists of  $\beta$ -endorphin (table), 302
  - physicochemical properties (table), 298
  - PYY schematic representation (fig.), 314
  - time courses of actions,  $\beta$ -endorphin (fig.), 303
- Pertussis toxin, hydrolysis of polyphosphoinositides, 244
- Phenylalkylamine
- binding, 369
  - effects, dihydropyridine binding, 370
- Phorbol, structure (fig.), 59
- Phorbol esters, activation of protein kinase C, 250
- Phosphatidylinositol, calcium-mobilizing receptors, generation of second messengers, 229
- Phosphoinositide hydrolysis, iris smooth muscle (fig.), 257
- Platelets, calcium role, 363
- Pollutants, effects on airway secretion, 279
- Polypeptides, active, effect on airway secretion, 282
- Polyphosphoinositides
- agonist-stimulated breakdown, 229
  - calcium-mobilizing receptors, generation of second messengers, 227
  - distribution and metabolism, 231
  - PIP<sub>2</sub> breakdown (fig.), 240
  - PIP<sub>2</sub> cycle (fig.), 232
  - recoveries from forebrain and iris smooth muscle (table), 231
  - smooth muscle response (fig.), 230
- Pregnancy, health aspects of cannabis, 4
- Prostaglandins
- arachidonic acid liberation from tissues (table), 252
  - calcium antagonism and calcium entry blockade, 334
  - cellular effects of cannabinoids, 50, 66, 67, 68
  - effect of cannabinoids (table), 53
  - effect on airway secretion, 283
  - leukotrienes and, 67
  - synthesis, cellular effects of cannabinoids, 65
- Protein kinase C, general properties, 248
- Psychopathology, health aspects of cannabis, 5
- Razdan, Raj K. Structure-activity relationships in cannabinoids, 75
- Receptors
- binding properties,  $\beta$ -endorphin, 299
  - calcium-mobilizing, polyphosphoinositides, generation of second messengers, 227
  - cannabinoid, 52
  - neurohumoral, pharmacology of airway secretion, 277
  - neurotransmitter, 60, 66, 68
  - opiate, binding potencies relative to  $\beta$ -endorphin (table), 300
  - opioid, 67
  - steroid, 61
  - types, rapid breakdown of polyphosphoinositides (table), 235
- Reflexes, muscle and visceral, capsaicin, 205
- Reproduction, cannabinoid pharmacology, 168
- Serotonin, calcium antagonism and calcium entry blockade, 337
- Smoking, plasma levels, tetrahydrocannabinol, 24
- Steroids, compared with cannabinoid structures (fig.), 61
- Submucosal gland
- physiology of secretion, 277
  - structure, pharmacology of airway secretion, 275
- Substance P
- capsaicin
    - inflammation, 213
    - neuropeptide release, 198
    - neuropharmacology, 180
    - nonsystemic administration, 191
    - peptide specificity, 217
- Synaptosomes, calcium entry blockers, 358
- Taylor, John W., and Emil Thomas Kaiser. The structural characterization of  $\beta$ -endorphin and related peptide hormones and neurotransmitters, 291
- Testis, calcium antagonism and calcium entry blockade, 362
- Testosterone, compared with cannabinoid structures (fig.), 61
- Tetrahydrocannabinol
- acute and chronic effects of cannabis, 2
  - AUC values (fig.), 28
  - CBD and, effects on activity and rectal temperature, mice (table), 81
  - chemical structure of metabolites (table), 36
  - heterocyclic analogs (table), 141
  - kinetics (table), 25
  - log concentration of plasma and reported "high" (fig.), 29
  - metabolism, 33
  - miscellaneous THC's, pharmacological effects (table), 136
  - natural and synthetic, pharmacological effects (table), 88
  - notations and symptoms in monkey (table), 79
  - other cannabinoids and, pharmacokinetics, emphasis on man, 21
  - pharmacokinetic parameters in man (fig.), 26
  - pharmacokinetics and distribution in animals, 31
  - plasma concentration and reported "high" (table), 29
  - plasma levels (fig.), 27
  - relative potency in rabbit model (table), 80
  - ring systems compared with benzopyran (fig.), 82
  - seizure-susceptible rabbit model, 79
  - structure-activity relationships in cannabinoids, 75
  - structure (fig.), 56
  - synthetic, pharmacological effects (table), 124
  - systemic availability (table), 27
  - time course of "high" versus plasma THC levels (fig.), 30
  - water-soluble derivatives (fig.), 60
- Thyroid, parathyroid and, calcium antagonism and calcium entry blockade, 362
- Tissue preparations, neuropharmacology of capsaicin, 196
- Tolerance, cannabinoid pharmacology, 158
- Trachea, calcium antagonism and calcium entry blockade, 346
- Urine
- excretion of tetrahydrocannabinol metabolites, 37
  - scheme for isolation of acidic metabolites (fig.), 34
  - structure of THC metabolites (fig.), 38
- Uterus, calcium antagonism and calcium entry blockade, 347
- Vas deferens, IC<sub>50</sub> values, calcium entry blockers (table), 347
- Veins, calcium antagonism and calcium entry blockade, 339
- Verapamil
- binding, 375
  - calcium channel receptor sites (fig.), 376
  - effect of diphenylpiperazines, 374
  - effect on cat papillary muscle (fig.), 351
  - inhibited nitrendipine binding (fig.), 371
  - negative inotropic action (fig.), 380
  - nifedipine and, effect on slow action potentials (fig.), 349
  - protection, 352
- Wibo, Maurice. See Godfraind et al., 321
- Widman, Marianne. See Agurell et al., 21