Psychopharmacology and Biochemistry of Neurotransmitter Receptors

Editors:
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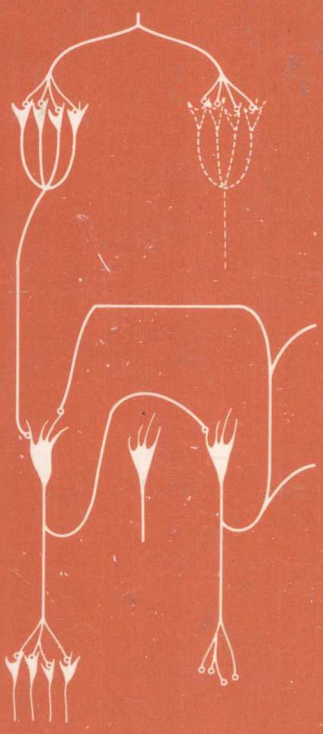

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PSYCHOPHARMACOLOGY AND BIOCHEMISTRY OF NEUROTRANSMITTER RECEPTORS

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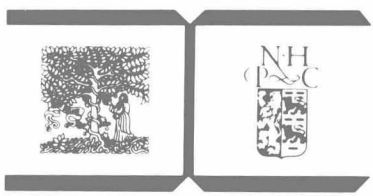

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PREFACE

This meeting brings together an outstanding group of contributors to the field of neurotransmitter receptors. The abundant progress in biochemical investigations on peripheral nervous system receptors in skeletal, smooth, and cardiac muscles, erythrocytes, and cells grown in culture, so well described at this symposium, is now increasingly being applied to problems of the more complex central nervous system.

Elegant studies on the protein components and subunits of various peripheral receptors, some analyzed with the new technique of monoclonal antibodies, have resulted in a considerable narrowing down of the possible models for neurotransmitter and drug action at the molecular level. Likewise, an explosion of information about central nervous system receptors for neurotransmitter and psychoactive drugs suggests imminent breakthroughs in the field of mental and nervous system disease are likely.

Two of the most striking concepts emerging from the meeting were the following: First, there is a heterogeneity of receptors for every neurotransmitter. This probably involves both multiple classes of discrete receptors plus multiple states for each class of receptors. Whichever of the several possible explanations accounts for the receptor heterogeneity, this added complexity must be sorted out for each receptor, whether one is interested in functional, pharmacological, or pathological aspects.

Second, neurotransmitter receptors are regulated in both the up and down direction, and on both rapid and slow time scales. These mechanisms of regulation undoubtedly have major importance in both normal and diseased nervous system function. One likely mechanism involves interconversion of the multiple states of receptors mentioned above, with levels of low and high affinity states determined by the past or recent history of the synapse.

Hopefully, the studies described in this book will stimulate rapid development in the neurosciences.

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ABBREVIATIONS

AcCoA = acetyl coenzyme A
AcCh = Ach = acetylcholine
AChR = acetylcholine receptor or cholinergic receptor protein
ADP = adenosine diphosphate
ADTN = 2-amino-6,7-dihydroxy-1,2,3,4-tetrahydronaphthalene
AMP = adenosine monophosphate
ANOVA = analysis of variance
AOAA = aminooxyacetic acid
APO = apomorphine
ATP = adenosine triphosphate

BgTx = bungarotoxin
BR = benzodiazepine receptor
BS = brain stem
BuTx = bungarotoxin
BZD = benzodiazepine

cAMP = c-AMP = cyclic AMP
CAT = choline acetyltransferase
CB = cerebellum
CBB = Coomassie brilliant blue
CD = cis-methyldioxolone
CF = climbing fiber
cGMP = cyclic GMP
Ch = choline
2 ClADO = 2-Chloroadenosine
CLN = CLO = clonidine
CNS = central nervous system
CoA = coenzyme A
CS = corpus striatum
CSF = cerebrospinal fluid
CSM = crude synaptic membranes
CTP = cytosine triphosphate
Ctx = cortex

DA = dopamine
dATP = deoxyadenosine triphosphate
dcAMP = deoxycyclic AMP
DHA = dihydroalprenolol
DHEC = dihydroergocryptine
DHP = α-dihydropicrotoxin
DMBB = dimethyl butyl barbiturate
DMI = desmethylimipramine
Dod SO_4 = dodecyl sulfate
DOPA = Dopa = dihydroxyphenylalanine
DPH = diphenylhydantoin
dtc = d-tubocurarine

EAMG = experimental autoimmune myasthenia gravis
EDTA = ethylene diamine tetraacetic acid
EEG = electroencephalogram
EGTA = ethyleneglycol-bis (β-amino-ethyl ether)-N,N'-tetra-acetic acid
EM = electron microscopic
ENK = enkephalin
EPI = epinephrine
EPS = extrapyramidal symptoms
eu = entropy units

FC = frontal cortex
FNPA = 4-fluoro-3-nitrophenylazide
FNZP = flunitrazepam

GABA = γ-aminobutyric acid
GABA-T = GABA transaminase
GAD = glutamic acid decarboxylase
GAG = γ-acetylenic GABA
GDP = guanosine diphosphate
GF/B = glass fiber filters
GMP = guanosine monophosphate
Gpp(NH)p = guanylimidodiphosphate
GPPNP = 5'-guanylimidodiphosphate
GTP = guanosine triphosphate

HA = histamine
HAL = haloperidol
HAT = hypoxanthine + aminopterine + thymidine
HATS = high affinity transport system
HD = Huntington's Disease
H_{12}-HTX = perhydro-HTX
HPLC = high performance liquid chromatography
5-HT = serotonin
5-HTP = 5-hydroxytryptophan
HTX = histrionicotoxin

ICV = intracerebroventricular
IHYP = iodohydroxybenzylpindolol
INH = isonicotinic acid hydrazide
I_{pi} = phasically active inhibitory neuron
ISH = interspike interval histogram
I_t = inhibitory neuron
ITP = inosine triphosphate

LA = left atrium
LPO = lactoperoxidase
LSD = lysergic acid diethylamide
LV = left ventricle

MAO = monoamine oxidase
MBTA = 4-(N-maleimido)benzyl-monium iodide trimethylam
MG = myasthenia gravis
MOPEG-SO_4 = 3-methoxy-4-hydroxy phenylethyleneglycol sulfate

NAD = nicotinamide adenine dinucleotide
NAP = nitroarylazidophenyl
NB = neuroblastoma
NE = norepinephrine
NPA = N-n-propylnorapomorphine
NTP = nucleotide triphosphate

6-OH-DA = 6-OHDA = OH-DA = 6-hydroxy-dopamine

P = principal (or, pacemaker) neuron
PAC = p-aminoclonidine
PD = Parkinson's Disease
PDH = pyruvate dehydrogenase
PGE_1 = prostaglandin E_1
PTA = phenyltrimethylammonium
PTZ = pentylenetetrazol

QNB = quinuclidinyl benzilate

RA = right atrium
RV = right ventricle

S = excitatory satellite neuron
S.B. = specific binding
SDS = sodium dodecylsulfate
SEP = intraventricular septum
SHR = spontaneously hypertensive rats
SP = substance P
Spi = SPIP = spiroperidol = spiperone
SRS = solubilized recognition sites

t_A = toxin binding site, anesthetic-binding
TDF = phenyltrimethylammonium diazonium fluoro-borate
TEAN = EDTA + ascorbic acid + nialamide
TETRAL = 2-(N,N-dipropyl)amino-5,6-dihydroxy-tetralin
TETS = tetramethylene disulfotetramine

THIP = 4,5,6,7-tetrahydroisoxazole (5,4 - c)pyridone-3-ol
t_m = toxin binding site blocked by MBTA
Tris = tris (hydroxymethyl)amino methane

UTP = uridine triphosphate

VMT = ventromedial tegmental

WKY = Wistar-Kyoto (rats)

YOH = yohimbine

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PART I

Acetylcholine Receptors and Ion Channels