

**Localization of the NMDA glutamate
receptor subunit R1 in the honeybee,
Apis mellifera neurons**

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by

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Chapter 1 is based on the following manuscript:

Identification and localization of the NR1 sub-unit homologue of the NMDA glutamate receptor in the honeybee brain

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The contribution of the different authors was as follows:

I prepared PCR, probes and also performed *in situ* hybridization and immunohistochemistry. Dr. Gérard Leboulle performed cDNA cloning, computational analysis, analysis of AmNR1-1 amino acid sequence and wrote the manuscript. Results and the manuscript were discussed with Dr. Fernando Locatelli, Jürgen Rybak, and Prof. Dr. Randolph Menzel.

For immunofluorescent study, I performed all experiments and watched when Dr. Fernando Locatelli and Dr. Gérard Leboulle were studied fluorescent signal with the confocal microscope. I got fluorescent photographs as files from them, and figure 5.2 from Dr. Gérard Leboulle.

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Abbreviations

AmCO	<i>Apis mellifera carnica</i> catalytic subunit of PKA
AmNR1	<i>Apis mellifera</i> NMDA glutamate receptor subunit R1
AMPA	Alpha-amino-3hydroxy-5-methylisoxazole
AP	Alkaline phosphatase
CAT	Choloramphenicol acetyl transferase
cAMP	Cyclic adenosine monophosphate
cDNA	Complementary DNA
cGMP	Cyclic guanosine 3',5'-monophosphate
CNS	Central nervous system
CREB	cAMP response element binding protein
DIG	Digoxigenin
DLG	Protein discs-large
DNA	Deoxyribonucleic acid
DNMDA-R1	<i>Drosophila</i> NMDA receptor subunit R1
dsDNA	Double stranded DNA
ELISA	Enzyme linked immunoabsorbent assay
EST	Expressed sequence tag
FMRF-amide	Phe-Met-Arg-NH ₂ -amide
GABA	Gamma-aminobutyric acid
GCCK	Gastrincholecystokinin
GlyR	Glycine receptor
GPCRs	G-protein coupled receptors
ITRs	Inverted terminal repeats
K cell	Kenyon cell
LTD	Long-term depression
LTP	Long-term potentiation
MB	Mushroom body
mGluRs	Metabotropic glutamate receptors
mRNA	Messenger RNA
NMDA	N-methyl-D-aspartate
NMDA-R1	NMDA receptor subunit R1
ORN	Olfactory receptor neuron
PER	Proboscis extension response

PCR	Polymerase chain reaction
PKA	Protein kinase A
PKC	Protein kinase C
PKG	Protein kinase G
PSD	Postsynaptic density protein
qRT-PCT	Real-time quantitative reverse-transcription polymerase chain reaction
rcf	Relative centrifugal force
RNA	Ribonucleic acid
RNAi	RNA interference
RT-PCR	Reverse transcription-polymerase chain reaction
Gr-hive A	Garden bees collected from the hive A
Gr-hive B	Garden bees collected from the hive B
Fl-hive A	Flight room bees collected from the hive A
Fl-hive B	Flight room bees collected from the hive B