

Contents

1	Introduction	1
2	Location, General Structure and Ependymal Cells of Sensory Circumventricular Organs	3
2.1	Subfornical Organ	3
2.1.1	Location	3
2.1.2	Ependymal Surface of the Subfornical Organ	7
2.2	OVLТ	7
2.2.1	Location and Structure	7
2.2.2	Ependymal Surface of the OVLТ.....	14
2.3	Area Postrema.....	15
2.3.1	Location and Structure	15
2.3.2	Ependymal Surface of the Area Postrema	16
3	Regional Subdivisions Within Sensory Circumventricular Organs	17
3.1	Subfornical Organ	17
3.2	OVLТ	19
3.3	Area Postrema.....	21
4	Vasculature, Compartmental Barriers, Neurons and Glia in the Sensory Circumventricular Organs	23
4.1	Subfornical Organ	23
4.1.1	Arterial Sources and Venous Drainage.....	23
4.1.2	Capillary Plexus	23
4.1.3	Compartmental Barriers	26
4.1.4	Neurons and Glia.....	28
4.2	OVLТ	28
4.2.1	Arterial Sources	28
4.2.2	Capillary Plexus and Venous Drainage.....	30
4.2.3	Compartmental Barriers	30
4.2.4	Neurons and Glia.....	30
4.3	Area Postrema.....	32
4.3.1	Arterial Sources and Venous Drainage.....	32
4.3.2	Capillary Plexus	32
4.3.3	Compartmental Barriers	33
4.3.4	Neurons and Glia.....	33

5	Neurochemical Aspects of Sensory	
	Circumventricular Organs.....	35
5.1	Receptors.....	35
5.1.1	Acetylcholine.....	35
5.1.2	Angiotensin.....	36
5.1.3	Bradykinin.....	39
5.1.4	Calcium.....	39
5.1.5	Calcitonin, Calcitonin Gene-Related Peptide Amylin and Adrenomedullin.....	39
5.1.6	Cholecystokinin.....	41
5.1.7	Endothelin.....	41
5.1.8	Galanin.....	42
5.1.9	γ -Aminobutyric acid.....	42
5.1.10	Glucagon-Like Peptide-1 Amide.....	42
5.1.11	Glutamate.....	43
5.1.12	Imidazoline Receptors.....	43
5.1.13	Lipopolysaccharide.....	43
5.1.14	Natriuretic Peptides (ANP, BNP and CNP).....	44
5.1.15	Neurokinin Receptors.....	44
5.1.16	Neurotensin.....	44
5.1.17	Neuropeptide Y, Peptide YY, Pancreatic Polypeptide	45
5.1.18	Prostaglandins.....	45
5.1.19	Purinergic Receptors.....	45
5.1.20	Relaxin.....	45
5.1.21	Serotonin.....	46
5.1.22	Somatostatin.....	46
5.1.23	Steroid Receptors.....	46
5.1.24	Vasopressin and Oxytocin Receptors.....	47
5.2	Neurotransmitters, Neuropeptides, Hormones and Enzymes.....	47
5.2.1	Acetylcholine.....	47
5.2.2	Angiotensin II, Angiotensin III and Angiotensinogen.....	47
5.2.3	Angiotensin-Converting Enzyme.....	48
5.2.4	Catecholamines.....	48
5.2.5	Cholecystokinin.....	49
5.2.6	Enkephalin.....	49
5.2.7	Glutamate, GABA and Glycine.....	49
5.2.8	Luteinising Hormone-Releasing Hormone.....	50
5.2.9	Neurotensin.....	50
5.2.10	Nitric Oxide Synthase.....	50
5.2.11	Orexins.....	52
5.2.12	Proopiomelanocortin Peptides and Enkephalin....	52
5.2.13	Serotonin.....	52
5.2.14	Vasopressin.....	54

6	The Neural Connections of the Sensory Circumventricular Organs	55
6.1	Subfornical Organ	55
6.1.1	Efferent Neural Connections	55
6.1.1.1	Viral Tracing	59
6.1.2	Afferent Neural Pathways of the Subfornical Organ	59
6.2	Neural Connections of the OVLT	61
6.2.1	Efferent Projections	61
6.2.1.1	Polysynaptic Efferent Pathways to the Periphery	62
6.2.2	Afferent Projections	63
6.3	Area Postrema	64
6.3.1	Efferent Neural Connections	64
6.3.2	Afferent Projections	66
7	Immediate-Early Gene Expression in Sensory Circumventricular Organs	67
7.1	Angiotensin II	67
7.1.1	Intravenous Infusion of Angiotensin II	67
7.1.2	Intracerebroventricular Angiotensin II	68
7.1.3	Endogenous Angiotensin II	69
7.1.3.1	Sodium Depletion	69
7.1.3.2	Haemorrhage	71
7.1.3.3	Isoproterenol	71
7.1.3.4	Locally Generated Angiotensin II in the CVOs	71
7.2	Baroreceptor Activation	72
7.3	Carbachol	73
7.4	Anorectic Peptides – Cholecystokinin, GLP-1 and Amylin	73
7.5	Hypertonicity	74
7.5.1	Intravenous Infusion of Hypertonic Solutions	74
7.5.2	Dehydration	76
7.6	Lipopolysaccharide (Endotoxin)	77
7.7	Relaxin	78
7.8	Vomiting and Emetic Stimuli	78
8	Functions of the Sensory Circumventricular Organs	81
8.1	Osmoregulation	81
8.1.1	Sites of Cerebral Osmoreceptors	82
8.1.2	Osmoregulation of Natriuresis and Renin Secretion	85
8.1.3	Influences of Relaxin on Osmoregulation	86
8.2	Central Actions of Circulating Angiotensin	87
8.2.1	Water Drinking	87
8.2.2	Angiotensin-Induced Vasopressin Secretion	88
8.2.3	Sodium Hunger	89
8.3	Influences on Arterial Pressure	90
8.3.1	Area Postrema	90
8.3.2	OVLT	92
8.3.3	Subfornical Organ	93

8.3.4	The Extended Autonomic Neuraxis	93
8.4	Area Postrema and Vomiting	94
8.5	Neuroimmune Responses and Fever.....	95
8.6	Concluding Remarks	97
References		99
Subject Index		123