A POTENTIAL ROLE OF THE SQUAMATE HARDERIAN GLAND IN VOMEROLFACTION

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A thesis submitted for the degree of Doctor of Philosophy at the Department of Anatomical Sciences, University of Adelaide, South Australia

submitted June, 1997
CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

1.2 THE HARDERIAN GLAND

1.2.1 NON-REPTILIAN TETRAPODS

1.2.1.1 MORPHOLOGY

1.2.1.2 VASCULARIZATION AND INNERVATION

1.2.1.3 TYPE OF SECRETION

1.2.1.4 FUNCTIONS

1.2.2 REPTILES

1.2.2.1 MORPHOLOGY

1.2.2.2 VASCULARIZATION AND INNERVATION

1.2.2.3 TYPE OF SECRETION

1.2.2.4 FUNCTIONS

1.3 THE NASAL CHEMOSENSORY SYSTEMS

1.3.1 THE ETHMOID REGION

1.3.2 EMBRYOLOGY OF THE NASAL CHEMOSENSORY SYSTEMS

1.3.3 THE VOMERO-NASAL SYSTEM IN TETRAPODS

1.3.4 MORPHOLOGY OF NASAL CHEMORCEPTION

1.4 A COMPARATIVE APPROACH TO THE STRUCTURE AND FUNCTION OF THE SQUAMATE HARDERIAN GLAND

1.4.1 INTRODUCTION

1.4.2 PHYLOGENY

1.5 AIMS AND SIGNIFICANCE

CHAPTER 2: MATERIAL AND METHODS

2.1 ANIMALS COLLECTED

2.2 HOLDING OF SPECIMENS
5.3 DISCUSSION.............................................................................................................75
  5.3.1 SQUAMATE VOMERONASAL MUCOSA......................................................75
  5.3.3 CONCLUSIONS.............................................................................................77

CHAPTER 6: THE HARDERIAN GLAND AS PART OF THE VNS.................79
  6.1. INTRODUCTION...............................................................................................79
  6.2 COMPARISON OF THE MUCOSAE..................................................................79
  6.3 IMPORTANCE OF SECRETORY STRUCTURES.........................................81
  6.4 EXTRINSIC SOURCES OF SECRETION FOR THE
      SQUAMATE VNO..............................................................................................82
      6.4.1 SALIVARY GLANDS...............................................................................82
      6.4.2 LACRIMAL APPARATUS........................................................................82
      6.4.3 THE HARDERIAN GLAND......................................................................83
      6.4.3.1 SCINCOMORPHA................................................................................83
      6.4.3.2 GEKKOTA...........................................................................................84
      6.4.3.3 SERPENTES.......................................................................................85
  6.4.5 CONCLUDING REMARKS..........................................................................86

APPENDIX 1..............................................................................................................88

REFERENCES........................................................................................................89

PLATES
ABSTRACT

The Harderian gland is a large orbital feature, whose structure and function varies among vertebrates. Thus far, scattered anatomical studies have been carried out on disparate squamate (Reptilia) species. In light of recent morphological findings, a role for the gland in vomeronasal function seems its most likely function. The two aims for this present study were: a) To morphologically examine the structure of the Harderian gland within major squamate clades, and b) to infer its potential role as a source of secretion for the squamate VNO. The latter aim was achieved by comparing the secretory capacity of the VNO to an analogous system, the main olfactory system (MOS), and thereby determine the necessity for the extrinsic glandular secretions. By using the comparative method, I was able to identify some evolutionary trends in Harderian gland, olfactory mucosa and VNO structure across a range of taxa. Representative species exhibiting olfactory (Gekko) or vomeronasal (Serpentes) specialisation, and non-specialised basal chemosensory adaptation (Scincensops) were examined. The Harderian glands and chemosensory structures were studied using light microscopic, histochemical and electron microscopic techniques. The Harderian glands were also analysed using microchemical (promise digestion), embryological and autoradiographic techniques. Despite some histological variations, this gland was, in all species, a serous secretory structure associated with the lacrimal apparatus (and thus the VNO). The squamate olfactory mucosa possessed serous secreting submucosal Bowman’s glands and mucous secreting sustentacular cells, which led to the formation of the heterogeneous mucous layer covering the sensory epithelium. The source of the serous component of the heterogeneous mucous layer in the VNO was less apparent. By comparing the secretory capacity of both the squamate MOS, and the structurally similar mammalian VNO, I concluded that there should be an extrinsic source of serous secretion for the mucous lining of the squamate VNO. Of the three candidates examined, the Harderian gland seemed most likely. Thus, though there was histological variation among phylogenetic lineages, the association between the serous secreting Harderian gland and the VNO is a consistent feature, and implies that the gland may be the extrinsic serous source for the mucous layer.