

# **Lumbar Intervertebral Disc Infection: Pathology, Prevention and Treatment**

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# Table of Contents

|  |     |
|--|-----|
| TABLE OF CONTENTS.....   | 2   |
| ABSTRACT .....   | 3   |
| DECLARATION .....  | 5   |
| ACKNOWLEDGMENTS .....  | 6   |
| CHAPTER 1: INTRODUCTION .....  | 7   |
| 1.1 Discitis .....   | 7   |
| 1.2 Symptoms, signs and investigations to diagnose iatrogenic discitis .....                                 | 9   |
| 1.3 Current theories for treating discitis .....   | 10  |
| 1.4 Current theories for preventing discitis .....   | 11  |
| 1.5 Thesis Objectives .....  | 13  |
| 1.6 References .....   | 14  |
| CHAPTER 2: EFFECTS OF INTERVERTEBRAL DISC INFECTION ON THE DEVELOPING OVINE SPINE.....                       | 22  |
| 2.1 Statement of authorship .....  | 22  |
| 2.2 Title page for published manuscript .....  | 23  |
| CHAPTER 3: THERAPEUTIC USE OF CEPHAZOLIN TO PREVENT COMPLICATIONS OF SPINE SURGERY .....                     | 35  |
| 3.1 Statement of authorship .....  | 35  |
| 3.2 Title page for published manuscript .....  | 36  |
| CHAPTER 4: PROPHYLACTIC CEPHAZOLIN TO PREVENT DISCITIS IN AN OVINE MODEL .....                               | 52  |
| 4.1 Statement of authorship .....  | 52  |
| 4.2 Title page for published manuscript .....  | 53  |
| CHAPTER 5: PREVENTING AND TREATING DISCITIS: CEPHAZOLIN PENETRATION IN OVINE LUMBAR INTERVERTEBRAL DISC..... | 69  |
| 5.1 Statement of authorship .....  | 69  |
| 5.2 Title page for published manuscript .....  | 70  |
| CHAPTER 6: PENETRATION OF CEPHAZOLIN IN HUMAN LUMBAR INTERVERTEBRAL DISC... ..                               | 85  |
| 6.1 Statement of authorship .....  | 85  |
| 6.2 Title page for published manuscript .....  | 86  |
| CHAPTER 7: FINAL DISCUSSION .....  | 100 |
| 7.1 Summary .....  | 100 |
| 7.2 Future Directions .....  | 103 |
| 7.3 Conclusion .....   | 104 |
| 7.4 References .....   | 105 |
| CHAPTER 8: AMENDMENTS .....  | 107 |
| 8.1 Structure and composition of the intervertebral disc .....   | 107 |
| 8.2 Comparison of the human and sheep disc .....   | 108 |
| 8.3 Dosing guidelines .....  | 109 |
| 8.4 Chapter Amendments .....   | 110 |
| 8.5 References .....   | 116 |

## **Abstract**

Discitis is a potential complication of any open or percutaneous spinal procedure which involves entry into the intervertebral disc. The infection initiates an inflammatory response which leads to endplate rupture. Although there are variations in the severity of symptoms, the main feature of discitis is severe back pain which is not relieved by rest. The infection may spontaneously resolve over time although incapacitating back pain may persist for many months. In some cases serious complications result from the spread of infection to the adjacent vertebral bodies and over time osteomyelitis will develop with resultant bone destruction and collapse. The prognosis for many patients with discitis is poor with continual disabling back pain, prolonged absence from gainful employment and inability to return to daily living activities.

Clinical and experimental evidence now supports the prophylactic use of a suitable antibiotic to prevent discitis. In South Australia cephazolin is the antibiotic of choice to prevent or treat discitis due to *Staphylococcus* spp. While cephazolin has been shown to prevent discitis after inoculation with *Staphylococcus* spp. it is not universally accepted. Uncertainty exists regarding the ability of the antibiotic to enter the disc, and if it is effective in preventing and treating discitis. This is further complicated by the lack of suitable methods for detecting and measuring the concentration of cephazolin in the disc.

An experimental ovine model was used to investigate (a) the natural progression of discitis in the growing lumbar spine; (b) a technique to detect and measure the concentration of cephazolin in the disc; (c) the effect of prophylaxis when dose and time of administration of cephazolin was varied; (d) the effect of parenteral cephazolin after discitis was established and (e) the influence of health and age of the disc on prophylactic and parenteral treatment with cephazolin. In a clinical study the concentration of cephazolin was measured in degenerate human disc tissue to determine if therapeutic concentrations were achieved.

The ovine studies showed that discitis had no significant effect on the development of the growing lumbar spine after one year although infection was associated with reduced disc area and height. Preventing discitis with cephazolin was reasonably successful, regardless of age and health of the disc. Timing of cephazolin administration was crucial to prevent discitis in immature animals.

A high-performance liquid chromatography technique was used to measure the concentration of cephazolin in the disc. The greatest concentration of cephazolin in ovine discs was achieved 15 minutes after a bolus dose of intravenous antibiotic was administered, although detectable levels were measured for a further 2 hours. The concentration of cephazolin was not uniform across the disc with greater concentrations in the outer disc compared to the inner disc. Although there were measurable levels of cephazolin in these discs, it was ineffective at treating discitis once established. In the clinical study detectable levels of cephazolin were recovered in human discs for more than 2 hours after administering a 1-g bolus dose. The concentration of cephazolin peaked in the human discs between 37 and 53 minutes, but in only half of the discs was the concentration of cephazolin considered therapeutic against *Staphylococcus aureus*.

While discitis may spontaneously resolve over time, the infected disc does not recover to its original form. Furthermore, parenteral cephazolin was ineffective at preventing endplate destruction once an intradiscal inoculum was established. While this study proved cephazolin is able to enter the disc and provide reasonable protection against infection, it appears that discitis cannot be completely abolished. The timing of prophylaxis remains a critical factor to achieve therapeutic concentrations of cephazolin in the disc. Due to the serious complications that result from discitis this study supports the use of prophylactic antibiotic administered at an optimal time before the disc is violated during any spinal procedure.

## **Declaration**

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution. To the best of my knowledge and belief this work contains no material previously published or written by another person, except where due reference has been made.

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Rebecca Walters

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