
EPIGENETICS AND PASTORAL COUNSELING

THE SCIENCE BEHIND WHAT WE PREACH

Evan Jones and Blaine Smith*

Department of Biology, Abilene Christian University, Abilene, TX 79699, USA

(Received 5 October 2011, revised 14 November 2011)

Abstract

The science of Behavioural Epigenetics is altering contemporary understanding of neurological development, namely the role that an organism's early environment plays in its behavioural development. As the science expands, it has implications for altering traditional notions of pastoral care, that is, the counsel expected from a spiritual advisor when a layperson is undergoing spiritual crisis. Rather than teaching resistance toward the sinful act, the pastor must work in recognition of the causal root of the problem and remove the individual from any environment that could potentially perpetuate the 'sinful' problem.

Keywords: Epigenetics, counselling, pastoral care, addiction therapy, depression therapy

1. Introduction

Although classically seen to represent conflicting areas of study, Science and Theology share many fundamental concordances. As proposed by the theoretical physicist and theologian John Polkinghorne, "in both Science and Theology, the central question is, and remains, the question of truth" [1]. Scientists and theologians struggle within their own disciplines to explain the nature of the Universe, including human behaviour. When scientists and theologians see the various disciplines as complementary rather than in opposition to one another, they can work together to answer the question of what causes a human to act in a specific way, and further, how to react to or treat an individual with such knowledge. In this spirit, we will examine the manner in which the fields of Behavioural Epigenetics and pastoral care can work synergistically to approach the issue of human behaviour.

Neither Science nor Theology, in and of themselves, are capable of providing full insight into the complexities of behaviour which theologians may categorize as sin or what a pastor's proper response might be toward the behaviour. It is the goal of this research to heuristically explore how scientific inquiry can be utilized alongside theological reflection in order to provide a

* E-mail: bds08b@acu.edu

more complete picture of why humans sin, and what methods a pastor might utilize to provide the best possible counsel to a congregation.

2. Traditional Genetics in light of the epigenetic paradigm

The field of Genetics is based on an established doctrine that serves as a guiding principle for the discipline. This doctrine holds DNA as the principal determinant of organismal development and behaviour. As posited by the geneticist Francis Crick, the dogma most central to Biology is that DNA is transcribed into RNA which is translated into proteins [2]. In the early 1960s, this idea formed the initial backbone of scientific inquiries into Genetics. An immediate inference which can be made from this claim is that hereditary information only flows in one direction, from the DNA to the proteins, and that proteins are unable to have an effect on the genes [3]. This furthermore hypostatized the idea of genetic determinism, which is the belief that the genome holds singular control over an organism's traits. New research suggests that organisms may not be at the mercy of their genes, which is an idea that is sure to leave scientists with additive claims as to the role of the genome in trait determination [4]. This research is collectively referred to as the science of Epigenetics. Its central proposition is that environmental stimuli can alter an organism's genetic expression without change to its genomic sequence and in doing so possess the capacity to codetermine everything from cell differentiation to organismal behaviour.

Epigenetics, by definition, refers to a change in phenotype that is heritable but does not involve DNA mutation [5]. Epigenetics mandates an expansion of the traditionally accepted paradigm in regard to genetic processes as indicated by Biology's central dogma. It does this by taking into account the multiplicity of external factors, such as prenatal and pubertal environmental stimuli, which work together with an organism's existing genome to culminate in an organism's behaviour. Epigenetic mechanisms include biochemical actions such as DNA methylation, histone acetylation, and further chromatin remodelling which have been proven to influence an organism's genome by means of gene activation, amplification or silencing. Epigenetic changes can have extenuating influences in various cell types, including those responsible for neural and cognitive development. The epigenetic mechanisms which cause behavioural and developmental changes appear to be of great significance in the pathophysiological understanding of neurodegenerative disorders such as Alzheimer's disease [6]; as well as in the understanding of physiological and psychological phenomena such as growth restriction [7], infant neurobehaviour [8], and schizophrenia [9]. An understanding of epigenetic mechanisms, the role an organism's environment plays in their initiation and the behavioural consequences which they propagate all form the basis of this inquiry into the frontier science of Behavioural Epigenetics.

As is the case with any scientific paradigm-shift, many may be sceptical concerning the legitimacy of even the most fundamental claims of Behavioural Epigenetics. A brief review of cellular and basic Biology should be sufficient to prove the plausibility of the claims of Epigenetics.

The most basic processes of a cell, including communication and differentiation, all take place in response to environmental signalling from stimuli such as hormones and neurotransmitters. A case study of cellular response to extracellular signals can be seen by examining the mechanisms by which our bodies respond to stress. Stress recognized within the brain results in an increased release of cortisol hormones from the adrenal glands. These hormones signal the cell to respond and adapt its functions, which may include activation or repression of specific target genes [10]. Even more basic than this precept is the maxim that Biology at all levels is characterized by adaptation and response to stimuli: it is a fundamental implication of natural selection. This information, accepted in scientific communities, should be sufficient to remind sceptics that cells constantly interact with their environment. Whether or not such interactions cause tangible modifications to a cell's epigenome is discussed in the following examples.

The Pavlovian Fear Conditioning test is a prime example of an organism's response to a given stressful situation [11]. The Pavlovian Fear Conditioning test macroscopically demonstrates an organism's recognition and response to environmental factors, and recent studies on the molecular effects of the test have provided insight into the means by which epigenetic mechanisms play a role in the process. In a study conducted on mice, a specimen was placed in an environment such as a box that sends small electric shocks to its feet. These shocks do not harm the mouse, but rather allow it to recognize the box as an adverse environment. The mouse is then placed in a neutral environment where no shock is applied for a period of 24 hours. Next, the mouse is placed back into the adverse environment, yet during this portion of the experiment no shock is applied to the mouse's feet. Even though the mouse is no longer experiencing physical shock, it displays stress-induced memory formation and exhibits a freezing behaviour. Recent studies have sought to explain this phenomenon in terms of Epigenetics by showing that mice exposed to the fear conditioning test exhibit phospho-acetylation of histone H3 which drives the chromatin remodelling essential in activating transcription in dentate gyrus neurons. These neurons, in turn, allow signalling into the hippocampus and as such are essential in the process of memory formation that underlies the freezing behaviour [12].

Comparative studies have also been conducted relating alterations in gene expression to drug use. These alterations in gene expression cause neural morphology and the behavioural changes associated with drug addiction. Specific cocaine-induced drug use appears to deregulate the epigenetic mechanism of methylation within a particular brain region of mice. Inhibition of this mechanism allows for neural plasticity within the nucleus accumbens neurons promoting a heightened preference for cocaine within the mice [13]. This study, along with others [14], establishes the essential role that epigenetic

mechanisms play in developing a mouse's affinity for cocaine and other drugs. These studies serve as specific examples of how environmental factors can alter and change an organism's behaviour, and more specifically of how epigenetic mechanisms are understood as key factors in the process.

Other studies have explored the implications of Epigenetics to humans and have revealed new possibilities for understanding the factors that may play a role in depression leading to suicidal behaviour. As a precursor to this research, understanding of the hippocampal portion of the brain and its functions is important. The hippocampus aids the body's response to anxiety [15], as well as memory formation [16, 17] and spatial recognition [18]. Despite great advances in psychopharmacological treatment, suicide and suicide attempts persist as major causes of mortality and morbidity [19]. Studies have shown a significant correlation between childhood abuse or neglect and suicidal behaviour or attempts [20]. A study conducted in 2010 showed that suicide victims, positive for childhood abuse or neglect, express decreased hippocampal volume and further cognitive impairments during their life and development. This study further elucidated epigenetic mechanisms as a key factor linking an adverse childhood to decreased hippocampal tissue. Hippocampal genes coding for ribosomal RNA, which is an essential component of a cell's protein synthesis machinery, were found to be hyper-methylated and therefore deactivated [21]. These biological mechanisms appear to be stimulated by environmental stimuli and consequently work in a concerted fashion to affect brain and behavioural development.

3. Applicability to pastoral care: a reconsideration of nature *versus* nurture

Essentially, what has been demonstrated by the science of Behavioural Epigenetics is that there is a tangible scientific link between the environment that an organism finds itself in and the manner in which an organism behaves. This claim has profound implications for those who deal professionally with human behaviour, such as pastors and psychologists. Behavioural Epigenetics has effectively uncovered an important piece of information in the nature vs. nurture debate. It holds that the answer to the nature vs. nurture debate is that both factors play an essential role in determining behaviour. Although it is true that an organism cannot express a gene that it does not have, it is also important to remember that the nurture of an organism can repress, activate, or amplify the genes of an organism and, as such, is equally integral in determining organismal behaviour; *this* is the essential claim of Epigenetics which we are integrating into a new conception of pastoral care. One could potentially claim that sinful behaviour no longer needs to be considered a function of something mysterious (Romans 7.15-25) but something engrained within one's physicality (the flesh) necessitating a complete withdrawal from the very environment which stimulates it. This information allows one to create a more complete picture of the causes of a given behaviour. It logically follows that the implications of Behavioural Epigenetics could beneficially be incorporated into the

methodology of a pastor for administering care to a congregant or patient rather than a strictly spiritual approach.

Before the science of Behavioural Epigenetics opened the door to our understanding of the psychological disorders of depression and addiction, those affected with these illnesses undoubtedly sought council from a plethora of sources in an attempt to relieve or mitigate their conditions. Those who have suffered from such illnesses, both physical and spiritual, throughout history and who participate in a spiritual community have turned to the church as a source of comfort and healing.

For example, in Hosea 5.15-6.1 (NRSV), God calls the people of Israel in their disobedience and trouble to seek him for healing: "I will return again to my place, Until they acknowledge their guilt and seek my face. In their distress they will beg my favour: 'Come, let us return to the LORD; for it is He who has torn, and He will heal us; He has struck us down, and He will bind us up'."

Similarly, throughout the New Testament God's people are urged to seek Him in their distress and to entrust their lives to godly leaders. 1 Thessalonians 5.12-13 (NRSV), for example, provides instruction for Christians to listen to and "respect those who labour among you, who have charge of you in the Lord and who admonish you. Esteem them very highly in love because of their work..." In essence, the Biblical principle is to respect those whom God has placed in roles of leadership, valuing their advice and receiving their care. The problem, however, is that spiritual leaders often see human behaviour solely as a spiritual issue, treating certain behaviours only as sinful acts, unmindful of the significant role physiology often plays.

This tendency often holds true in the case of addiction, which in Christian practice is commonly viewed merely as a spiritual issue, on the grounds that the individual who is addicted places his or her desire for finite objects or pursuits above the will of God. Although it is potentially a caricature, church customs within the Anglican tradition have held similar views of addiction as sin. Central to the beliefs of Anglicans and many religious traditions, sin is recognized as any behaviour that leads to disobedience or lack of control within the Church or one's personal life [22]. Thus, addiction, whether it is to drugs, alcohol, sex, or any other stimulus, is recognized as sinful because it inevitably leads to lack of control and disorder within one's life. The pastoral practice of treating such conditions with this prescription suggests that the person, by merely submitting to a strict, disciplined lifestyle of rules and punishments, will be deterred from giving into such desires [23]. The individual is expected to resist the urges of their addiction, often without success. Integrating the science of Epigenetics into pastoral care suggests that the more successful way of preventing relapse would be to remove the patient entirely from the very environment which stimulates the behaviour.

Christian practice has viewed anxiety and depression similarly – as sinful behaviour. At the risk of oversimplification, the Lutheran tradition has viewed depression as the result of sin based on two primary factors: worry and anxiety [23, p. 20]. These components of depression are viewed as sinful because they

reflect an incapacity to trust God, which Luther regarded as sin [24]. Consequently, the Lutheran tradition might view worry and anxiety as specifically sinful acts, because the individual is seen as displaying an inept will to trust God with his or her life and problems. There are still further precedents within the church for treating depression as sin. According to the psychologist Gary R. Collins, "...it is also wrong, as well as unhealthy, to be immobilized by excessive worry. Such worry must be committed to prayer to God, who can release us from paralyzing fear or anxiety..." [25] With this pastoral care method, often the only 'cure' is to have the person experience a deep feeling of repentance towards their current state in order to accept and receive forgiveness in their heart [23, p. 20]. Unfortunately, this approach does not address the individual's whole problem. The very biochemical imbalances in the brain that cause the anxiety and depression, and thus the expression of genes for production of serotonin and other neurotransmitters which can alter mood, must be treated as well as providing cognitive therapy. Thus pastoral and spiritual approaches could be supplemented with an understanding of how epigenetic mechanisms affect behaviour traditionally labelled merely as sin. This approach may help a Church member escape their ailment more effectively than simply praying for forgiveness and deliverance from said ailment – it provides concrete physical steps to take in addition to spiritual practices. Each treatment, whether spiritual or physical, becomes adjunctive therapy for a synergistic effect of delivery from the 'sinful' condition of depression and anxiety.

Utilizing the science of Behavioural Epigenetics, we have proposed alterations to refine pastoral methods that sometimes treat physically-based behaviours (addictions and brain disorders such as anxiety and depression) merely as sin. We accomplish this by redefining the behaviours of addiction and brain disorders, including environmental effects upon the epigenome as an additional causal factor. Although science of any sort should not be seen as replacing the important role of spiritual care in escaping an addiction or brain disorder, Behavioural Epigenetics can provide additional help regarding addiction and depression/anxiety by taking into account the importance of physical factors in their development.

4. Conclusion: a hope for the future of pastoral counselling

In essence, Behavioural Epigenetics suggests that church counsel could be improved if spiritual leaders would recognize the role environmental factors play in the development of psychological disorders, and that they should work to understand the role a person's environment plays in the development and expression of psychological ailments as they administer counsel to Church members under their care. Recognizing 'sin' as having a genetic and environmental basis (epigenetics) should improve our service to others in the name of Christ.

Behavioural Epigenetics has numerous implications for the methods by which Church leaders offer council to members of their church who are in spiritual crisis. Our research suggests that the environment in which an organism finds itself can play a significant role in its development, as well as act as a stimulus which triggers 'sinful' behaviour. With this in mind, it seems evident that pastors could adjust their spiritual counsel to recognize that a better mechanism for avoiding a particular behaviour is to extract oneself from the environment which acts as a stimulus. For example, imagine the alcoholic congregant seeking counsel. Rather than suggesting that he merely rely on self-control and spiritual discipline to resist the temptation to drink alcohol, a spiritual counsellor should suggest that the layman rid his or her house and surroundings of all alcohol and avoid routes that take him or her by liquor stores. Likewise, the pastor should acknowledge that a depressed individual could easily be a product of their direct or past environment. As a result, the pastor should work to remove the individual from a deleterious environment or consider a past environment, instead of merely acknowledging that their worry and anxiety is sinful and counselling the individual to change by only seeking forgiveness.

The studies concerning Behavioural Epigenetics illustrate that modifying one's environment can significantly affect an individual, either in an advantageous or deleterious manner in regard to their physical, psychological, or spiritual being. These implications of Behavioural Epigenetics recognize the causal factors of problems such as addiction and depression, and as such are relevant in a clerical setting due to their effect on a pastor's role in treating said ailments. When these pastoral methods take into account the scientific and, more specifically, behavioural epigenetic understanding of human development and behaviour, a more holistic and reconcilable solution to harmful behaviours can be reached. There are, of course, holistic pastoral approaches that already work to take both spiritual and physical factors into account when providing care. These studies concerning behavioural epigenetics should serve as a scientific confirmation of practices that these pastors already employ.

Acknowledgements

We thank our professor and mentor, Professor Daniel K. Brannan, Ph.D. in the Department of Biology at Abilene Christian University for offering essential insights and suggestions on this paper.

References

- [1] J. Polkinghorne, *Belief in God in an Age of Science*, Yale University, New Haven and London, 1998, 47.
- [2] F. Crick, *Nature*, **227** (1970) 561.
- [3] F. Crick, *On Protein Synthesis*, Symposia of the Society for Experimental Biology: The Biological Replication of Macromolecules, Cambridge University Press, Cambridge, **12** (1958) 138-162.

- [4] P.H. Silverman, *The Scientist*, **18** (2004) 32.
- [5] C.D. Allis, T. Jenuwein, D. Reinberg and M. Caparros, *Epigenetics*, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, 2007, 2.
- [6] T. Abel and R.S. Zukin, *Curr. Opin. Pharmacol.*, **8** (2008) 57.
- [7] A.C. Filberto, M.A. Maccani, D. Koestler, C. Wilhelm-Benartzi, M. Avissar-Whiting, C.E. Banister, L.A. Gagne and C.J. Marsit, *Epigenetics*, **6** (2011) 566.
- [8] B.M. Lester, R.J. Miller, K. Hawkes and A. Salisbury, *Semin. Perinatol.*, **35** (2011) 8.
- [9] D.P. Gavin and R.P. Sharma, *Neurosci. Biobehav. Rev.*, **34** (2010) 882.
- [10] B. Alberts, D. Bray, K. Hopkin, A. Johnson, J. Lewis, M. Raff, K. Roberts and P. Walter, *Essential Cell Biology*, 3rd edn., Garland Science, New York, 2010, 538.
- [11] S. Maren, *Annu. Rev. Neurosci.*, **24** (2001) 897.
- [12] J.M.H.M. Reul and Y. Chandramohan, *Psychoneuroendocrinology*, **32** (2007) S21.
- [13] I. Maze, J. Feng, M.B. Wilkinson, H. Sun, L. Shen and E.J. Nestler, *Proc. Natl. Acad. Sci. USA*, **108** (2011) 3035.
- [14] R. William and E.J. Nestler, *Trends Mol. Med.*, **14** (2008) 341.
- [15] J.A. Gray and N. McNaughton, *The Neuropsychology of Anxiety: An Enquiry into the Functions of the Septo-Hippocampal System*, Oxford University Press, New York, 2000.
- [16] L.R. Squire, *Psychol. Rev.*, **99** (1992)195.
- [17] H. Eichenbaum and N.J. Cohen, *Memory, Amnesia, and the Hippocampal System*, MIT Press, Cambridge, 1993.
- [18] J. O'Keefe and J. Dostrovsky, *Brain Res.*, **34** (1971) 171.
- [19] J.J. Mann and H. Hendin, *Ann. NY Acad. Sci.*, **932** (2001) vii.
- [20] M. Seguin, A. Lesage, G. Turecki, M. Bouchard, N. Chawky, N. Tremblay, F. Daigle and A. Guy, *Psychol. Med.*, **37** (2007) 1575.
- [21] P.O. McGowan, A. Sasaki, T.C.T. Huang, A. Unterberger, M. Suderman, C. Ernst, M.J. Meaney, G. Turecki and M. Szyf, *PLoS ONE*, **3** (2008) e2085.
- [22] J. Sears McGee, *The Godly Man in Stuart England: Anglicans, Puritans, and the Two Tables, 1620-1670*, Yale University Press, Connecticut, 1976, 163, 238, 248.
- [23] E. Brooks Holifield, *A History of Pastoral Care in America: From Salvation to Self-Realization*, TN: Abingdon Press, Nashville, 1983, 21.
- [24] M. Luther, *Three Treatises*, Fortress Press, Philadelphia, 1960, 210, 212-214.
- [25] R.G. Collins, *Christian Counseling. A Comprehensive Guide*, Thomas Nelson, Nashville, 1988, 66.