Chapter 19
Genetic–Memetic Prevention

Contents

19.1 Epigenesis in Prevention

Genes are turned on or off in early life in interaction with environment through the mechanism of *epigenesis* discussed in Chapter 2. Epigenesis involves the inactivation of genes through methylation and reactivation through acetylation and through modification of the histone configuration surrounding them.

For example, the short allele (*s*) of the serotonin transporter promoter gene (SERT, 5-HTTLPR) may confer vulnerability to heightened stress response if the individual had been exposed to abuse in childhood and to depression in adulthood if exposed to stress. But the vulnerability largely disappears without the experience of childhood abuse (Caspi et al., 2003; Pezawas et al., 2005). In rhesus monkeys, the vulnerability associated with the short allele of the SERT gene was ameliorated with good attachment relationships in childhood (Suomi, 2003, 2005).

With monoamine oxidase gene polymorphism, the MAOA-L that results in low levels of the enzyme and thus high levels of monoamines in the brain during the developing phase of the brain, childhood abuse was associated with increased risk of violence and the development of antisocial personality in later life (Caspi et al., 2002). In women, it is also associated with alcoholism and antisocial personality (Ducci et al., 2008). MAOA-H, which causes increased levels of MAOA, buffered against the effects of childhood abuse and neglect in causing later violence and antisocial behavior in whites but not in nonwhites (Widom and Brzustowicz, 2006).

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Meyer-Lindenberg and her colleagues have shown, using MRI and fMRI, that the MAOA-L variant predicted pronounced reductions in the volume of anterior cingulate gyri and bilateral amygdalae and hyperresponsivity of the left amygdala during emotional arousal, with diminished reactivity of regulatory prefrontal regions, compared with the high expression allele (MAOA-H).

The MAOA gene is X-linked, and in men, the low expression allele (MAOA-L) was also associated with changes in orbitofrontal volume, amygdala and hippocampus hyperreactivity during aversive recall, and impaired cingulate activation during cognitive inhibition. A pronounced effect of genotype and sex was found in left amygdala and hippocampus, i.e., men, but not women, carrying the MAOA-L genotype showed increased reactivity during retrieval of negatively valenced emotional material. In men only, MAOA-L genotype showed a pronounced lack of activation of dorsal anterior cingulate during response inhibition task (Meyer-Lindenberg et al., 2006).

In addition to the gene–stress interactions discussed above, more vulnerability genes have been identified for suicidality (Wasserman et al., 2007, 2008), obesity as well as breast cancer (Wasserman et al., 2004), and somatic symptoms and violence (Crofford, 2007).

Epistasis, or interaction between two different genes, may play an important role in whether or not gene-associated vulnerabilities may actually manifest. For example, the polymorphism in brain-derived neurotrophic factor (BDNF) gene, BDNF-MET allele, is associated with reduced responsivity to 5-HT signaling and protects against 5-HTTLPR *s* allele-induced effects on a brain circuitry encompassing the amygdala and the subgenual portion of the anterior cingulate. Without the BDNF-MET alleles (BDNF VAL/VAL), 5-HTTLPR *s* allele is associated with volume reduction in anterior cingulate, but with BDNF-MET, there was no decrease in its volume (Pezawas et al., 2005).

Mental health or mental illness is a result of interaction among vulnerability and resilience genes and salutary and pathogenic memes. Thus memetic prevention of mental illness should focus on (1) reduction of stress memes for children with vulnerable genes and (2) prevention of pathogenic memes from taking up residence in the brain.

19.2 Early Diagnosis and Treatment of Vulnerable Children

Should children with vulnerability genes be identified and treated? Experience with genetic testing of children for risk of colorectal and breast cancer seem to indicate that such testing does not generally have an adverse effect on children (Codori et al., 1996, 2003; Eley, 1999; Michie et al., 2001; Tercyak et al., 2001). On the other hand, whether identifying children at risk for mental illness would result in stigmatization is another issue (Brody, 2002; Chipman, 2006; Hercher and Bruenner, 2008; Spriggs et al., 2008; van Ommen, 2002).

Stigmatization is particularly problematic if there is no remedy for the genetic condition, but it seems that for mental illness, memetic intervention should be possible once the vulnerability genes have been identified. Furthermore, we recognize that so-called vulnerability genes might also serve an adaptive function, thus treatment may not be necessary for all individuals with such genes. Examples are the heightened sensitivity to interpersonal cues in anxiety-associated genes (e.g., 5-HTTLPR *s/s*) or assertiveness and novelty seeking possibly associated with MAOA-L.

Prevention through reduction of extreme stress in childhood, especially child abuse and neglect particularly geared to those with 5-HTTLPR *s* and MAOA-L, however, should have significant beneficial effect as demonstrated in monkeys (see Chapter 2). Perhaps genetic testing should be performed for all suspected child abuse cases, and for those individuals with vulnerability genes, special attention could be paid either to remove the child from the environment or to provide closer attention, education, and care.

19.3 Early Protection from Pathogenic Memes

In addition to the stress of childhood abuse and neglect, which are often both memetic and physical (i.e., direct physiologic and nutritional stress on the tissues), prevention of pathogenic memes from taking up residence and multiplying in the brain is an important issue.

Just like bacteria and fungi, all memes are potentially pathogenic if they are allowed to multiply uncontrollably. On the other hand, like most normal flora, most memes can enter the brain harmlessly and either take up residence as a relatively harmless parasite or be rendered harmless by the filtering mechanism of the brain and allowed to become dormant or die. Then there are memes that are both necessary and salutary for the human brain – memes for knowledge and skills.

Unfortunately, most destructive memes take up residence in the brain from early childhood and destroy or stunt the ability of the brain to develop adequate filtering and processing mechanisms for incoming memes. These destructive memes accept and exalt irrationality and blind faith and ask us to abandon critical thinking and reasoning – the memes and memeplexes associated with superstition, religion, and cultural traditions. Religion is particularly powerful and toxic if introduced early in childhood as it provides ready and easy answers as dogma to a questioning mind. Often religion, superstition, cultural traditions, and family are bound together rendering it practically impossible for children to free themselves from one of the components.

As it is impossible to isolate children from exposure to the pathogenic memes of religion and culture, children should be exposed to as many different religions and cultures as possible, so that they can develop the ability to compare and critique them. Children should be taught in what ways different cultures, traditions, and beliefs differ from each other and what consequences they entail in terms of social and family institutions and mores. For example, how did Christianity affect

class and gender relationships? What was the role of Confucianism in an authoritarian society? What is common between religions and superstition? What is the difference? What are the value systems derived from Catholicism vs. Protestantism? Buddhism and Islam? What are the functions of cultural traditions? Which traditions are rational and which are irrational? Such critical thinking will lead to an ability to process them, retaining the component memes that are salutary while quarantining and neutralizing toxic memes.

Memes are stored in and transmitted by electronic and print media. The explosive growth in media in recent years has resulted in a constant and relentless bombardment of memes on the brain. In this environment of relentless competition of memes for survival and replication, it is only natural that the most aggressive (and often virulent) memes will be advantageous. Thus, memes that strongly appeal to emotions, basic drives, and basic fears tend to be more successful. Such memes are those of violence, sex, and fear of death, and the irrational security promised by religion.

In addition to enhancing the skills of critical thinking in children, it would be important to teach them how to take "time out" from the bombardment of memes from the environment. Teaching children techniques of broad-spectrum meme reduction as discussed in Chapter 16 would be an important step. Children should also be taught general stress management and coping skills.

It is neither desirable nor possible to limit or censor the memetic content of the media, but it may be possible to introduce salutary memes in the media that may neutralize or attenuate extremely toxic memes. For example, empathy memes might be introduced together with violence memes, and memes for rational thinking may be introduced with religious memes. Just how to do this would depend on the context and content of the media – for example, the hero of an action movie might be multidimensional with an empathic and loving side.

19.4 Vaccination

Is vaccination possible for toxic memes? Gold and Shanks argue that cultural diversity will confer immunity to toxic conformity memes as genetic diversity tends to confer enhanced immunity to infection (Gold and Shanks, 2002). In a fascinating webpage, Kubiak describes how foreign ideas (memes) were quarantined in Asia (for example, those who traveled to foreign countries were isolated from others until they re-acculturated themselves with the indigenous one) and how the McArthur reforms after World War II might have served as a memetic vaccination against democracy in Japan when they had to be to a large extent reversed for fear of communism (Kubiak, 1998).

It seems clear that quarantining memes in the age of the Internet and information explosion is untenable and undesirable, considering that even Burma and North Korea may be on the brink of change. Natural vaccination in the form of enhancing cultural diversity in the society is both effective and desirable. It should also be possible to deliberately vaccinate people, especially children, against toxic memes.

Vaccination involves boosting the immune system, and the immune system for memes relies on reason and critical thinking. Thus, general boosting of these abilities through education would be a first step. Then, irrational and toxic memes should be introduced in an attenuated form. How to attenuate toxic memes? By divesting them of the aesthetically pleasing adornments, such as music, art, and edifices that usually accompany them as in religious hymns, art, and churches and mosques. Just present the basic mythologies of any religion or tradition or blind belief to a critical and questioning mind, and immunity will develop pronto. Then, the adornments can also be presented and can be appreciated for their own sake, without being suckered into the irrational and toxic memes.

Infusion of antibodies in the form of critiques of toxic memes may also be useful. One danger of such infusion, however, may be that immunity may develop against the critiques if they are introduced in an authoritarian manner. Thus, introducing both the toxic memes and the critiques at the same time would be more effective.

"Flooding" with toxic memes may be another means of vaccination in certain situations. For example, persons who might be somewhat attracted to specific toxic memes, for example, a cult, might be invited to participate in an intensive simulated or virtual reality indoctrination experience. Strong counter-memes (antibodies) are likely to develop very quickly.

19.5 Education

It should be obvious from our discussion so far that education must be the centerpiece in the prevention of multiplication of toxic memes in the brain, and thus of mental illness. Education from an early age in the acquisition and practice of rational and critical thinking will enhance the development of the sorting and filtering process for incoming memes.

Once identified, toxic memes must be processed so that they are rendered harmless. The techniques of doing this must be a part of the educational process. Such methods would include analyzing the components of the toxic memes, recognizing the capsules and adornments associated with such memes that are meant to be attractive and aesthetically pleasing, and relegating them to the pool of irrational memes that can be a source of amusement rather than threat. For particularly virulent memes, techniques discussed in Chapter 17, broad-spectrum memetic therapy may be utilized to reduce their proliferation. Such techniques include relaxation, meditation, music, and exercise, among others.

19.6 Gene–Meme Cooperation vs. Gene–Meme Conflict: "Mind" and "Body"

An important aspect of education should be to discuss the "mind–body" problem in memetic terms. The "body" is the manifestation of the genes in action. The "mind"

is the activity of the brain processing memes. Since the brain is made of genes and their products, it is geared to be on the side of the genes if there is a conflict between genes and memes. Memes are, of course, concerned only with their own replication even at the expense of genetic interests. Infectious martyrdom is an example of a virulent meme that spreads at the expense of the individual and his/her genes.

Recognition of the potential conflict of interest between genes and memes can result in a rational analysis of the conflict, and thus identify the self-interest of the meme masquerading as altruism or a "holy cause." On the other hand, reason may be on the side of the memes when an impulse generated by genes threatens to take hold of the brain and result in an injudicious action.

A memetic analysis of history will reveal how human beings have been exploited by virulent memes in various epochs, in the forms of oppressive religion, nationalism, racism, and communism, among others, resulting in holy wars, holocausts, and genocides.

Memes arose from genes in the course of evolution. With *Homo sapiens*, memes have evolved exponentially while genes remained stagnant. As memes evolved, i.e., became more sophisticated in replication, they co-opted the gene-based bodies for their own purpose and dictated individuals to obey their bidding. Now memes may have matured enough and developed enough not to require human brains to replicate. This may have a liberating effect on the humans, as those memes that remain in human brains may become more symbiotic rather than virulently parasitic. If memes can live independently and thrive outside of the brain in computers and cyberspace, then they do not have to take over the brain, but could cooperate with the genes of the brain for mutual benefit. The brain may be just a temporary residence for some memes. While memes may no longer need the brain, the brain may still be able to contribute to memes, perhaps by creating novel ones.

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