Nataliya Dominskaya 12/06/2011

 Why do some people seem to age well, while others spend their later years infirm and unhappy? Why do we age? What is the nature of senescence, and can its process be altered? How can we live healthier and more fulfilling lives? Why do some people age successfully, and others don’t? Why do some 80-year-olds look like 60-year-olds while some 60-year-olds look like they are 80?

 To answer these questions, scientific theory is required. According to Bonder, Haas, &Wagner (2009), “theory is an attempt to explain what we observe in empirical research or practice. Theories of aging are attempts to go beyond the what of symptoms or disabilities associated with aging to examine the why and how of changes related to age” (p.29). Gerontologists concern themselves with these questions.

The phenomenon of aging has long been of interest to humankind. In recent years, when life spans have lengthened and number of older people has increased in our society, special attention has been given to better understanding the aging process. Over the past several decades, gerontology has endeavored to build better scientific theories. Scientific theories are based on the idea that the natural universe has fundamental properties and processes that explain phenomena in specific contexts, that knowledge can be value free, that it can explain the actual workings of the empirical world, and that it can be revised by a better theory as a result of careful observations of empirical events (Bonder, Haas, & Wagner, 2009).

In my paper, I will be discussing one of the biological and one of the sociological theories of aging, which appeal to me the most.

Biological theories address aging processes at the organism, molecular, and cellular levels. Biological theories of aging might explain why one individual remains flexible, while others lose physical function. Biological theories fall into one of two general classes: stochastic theories, and programmed (nonstochastic) theories. Although these theories differ, both of them agree that, in the end, the cells in the body become disorganized or chaotic and are no longer able to replicate, and cellular death occurs. When enough cells die, so does the organism (Touhy &Jett, 2010). Stochastic theories, the free radical theory in particular, drew my attention. Stochastic theories explain aging as the result of accumulation of errors in the synthesis of cellular DNA and RNA, the building blocks of the cell. With each replication, more errors occur, until the cell is no longer able to function (Touhy & Jett, 2010). One of the stochastic theories is the free radical theory.

The free radical theory of aging was conceived by Denham Harman in the 1950s, when prevailing scientific opinion held that free radicals were too unstable to exist in biological systems, and before anybody had invoked free radicals as a cause of degenerative diseases. Free radicals are described as highly reactive atoms or molecules in which an electron pair has been separated into two electrons that exhibit independence of motion, and are capable of initiating a chain reaction with stable molecules to generate more free radicals. The highly reactive nature of free radicals and their generation in cells would lead to widespread damage particularly in the mitochondrial and microsomal membranes which contain oxidative enzymes such as monamine oxidase and microsome cytochrome oxidase. Further damage has been envisaged to occur by oxidative alterations in collagen, elastin, DNA, mucopolysaccharides, and lysosomes leading to the formation of ceroid pigment, which is a naturally occurring lipid pigment with histochemical characteristics, and which accumulates in various tissues in certain experimental and pathological conditions (Merry, 1987). According to Merry, free radical formation and oxidative activity have been found to be the basis of certain pathological states such as fibrosis of arterioles and capillaries due to membrane damage. Merry also states in the article that the fact of accumulation of cellular damage and an inadequacy of cellular repair mechanisms correcting such damage lies in the free radical concept. Harman in his work described the aging process as the sum of the deleterious free radical reactions going on continuously throughout the cells and tissues. He also proposed that free radicals are implicated in such pathologies as cancer, cardiovascular diseases, degenerative diseases of the central nervous system, and the functional decline of the immune system (Merry, 1981).

 Talking about sociological theories of aging, they are different from biological ones because they are not always based on empirical evidence due to methodological and measurement-related problems. Sociological theories attempt to explain and predict the changes in roles and relationships in middle and late life, with an emphasis on adjustment. The basic theories were developed in the 1960s and 1970s and said to be viewed within the context of the historical period from which they emerged. One of the sociological theories which is interesting to me is the activity theory.

The activity theory of aging proposes that successful aging occurs when older adults stay active and maintain social interactions. The activity theory was one of major theories that outlined successful aging in the early 1960s. The theory was developed by Robert J. Havighurst in 1961. He supported the popular viewpoint of that time that emphasized continued social role participation to be necessary for positive adjustment to old age. He believed that maintenance of high activity levels was important to inhibit the negative effects caused by old age and thus improve life satisfaction. The idea implied in the theory was that the elderly had essentially the same psychological and social needs as middle-aged persons, except for the inevitable biological changes. Havighurst blamed the society withholding the opportunities for interaction for decreases occurring in social roles and activities of the elderly. According to the theory, in response to that, well-adjusted persons tried to maintain their life style of middle age as long as possible, and when losses such as retirement or death of a spouse occurred, those persons substituted the roles or activities quickly (Burbank,1986).

So, overall, the theory implies that the more active elderly people are, the more likely they are to be satisfied with life. And activity can be physical or intellectual in nature. To maintain a positive self-image, the older person must develop new interests, hobbies, roles, and relationships to replace those that are diminished or lost in late life.

As any other theory has its strengths and weaknesses, so does the activity theory. Let’s consider an elderly person who has functional limitations, lack of income, or simply, lack of a desire to maintain a middle-aged lifestyle. Many older adults lack the resources to maintain active roles in society. On the flip side, some elders may insist on continuing activities in late life that pose a danger to themselves and others, such as driving at night with low visual acuity or doing maintenance work in the house while climbing with severely arthritic knees. In doing so, they are denying their limitations and engaging themselves in unsafe behaviors. These are the issues which are not taken into consideration in the theory, - and I view them as the weaknesses of the current theory. Moreover, because of improved general health and prosperity in the older population, remaining active is more feasible now than when this theory was first proposed by Havighurst nearly six decades ago. The activity theory is applicable for a stable, post-industrial society, which offers its older members many opportunities for meaningful participation (Touhy & Jett, 2010). This also can be considered as the theory’s weakness.

As far as the strengths of the theory are concerned, it does prove the fact, that having successful aging, and thus being able to maintain a positive sense of self is due to the fact that an older person develops new interests, roles, and relationships in order to replace those that are lost in late life. My mother-in-law, a 75-year-old woman, has lost her husband one year and a half ago. Later on, she has found out she has cancer, - has been operated on and has undergone the radio therapy. She felt the happiness and luck have turned away from her. She felt very depressed: she spent most of her time in her apartment alone and complained to us about how her life was not worth living. But now that her granddaughter has been born, and she has taken a new role of a grandmother, babysitting the baby, she has changed and her attitude to life has changed. I think this example does exemplify this view of aging. Another example that supports this theory, to my mind, is the existence of community centers for older adults. Last semester I had Community Health course. My clinical setting was in Sunset Park Community Center for Older Adults. I think the concept of the senior center (any senior center) is based on the activity theory of aging. The programs (arts-oriented activities, Yoga, Tai Chi) and services (walking group, educational and recreational trips) the center provided had important benefits and contributed to increased life satisfaction for the majority older adults in the center by allowing them to engage in ongoing social activity; maintaining recreational roles; encouraging them to remain active and develop own-age friends.

There was also some research done which supports my view about aging. The study of 100 individuals above age 65 years in a small Midwestern town was done by Havighurst, the developer of the activity theory, and Albrecht. Data were gathered by interview method. That was a cross-sectional study, with some interviews being repeated. Measures used were a role instrument consisting of a set of 13 role areas with 10 levels of activity defined in each role area. Personal adjustment was measured in two ways: Attitude Inventory, designed to measure feelings of happiness, usefulness and satisfaction with activities, health, and economic status; and the Cavan Adjustment Rating Scales (Burbank, 1986).

Findings indicated that a high degree of activity in one role was associated with a high degree of activity in other roles. Mean role activity scores were higher for women than men, and a gradual decrease of role activity with age and with declining social status was noted. As some roles decreased, compensation was made by increasing other roles, such as the grandparent role. Positive correlations were noted between activity and attitude and adjustment scores (Burbank, 1986).

Coming back to the free radical theory of aging, it implies that antioxidants such as Vitamin A, vitamin C, vitamin E, and Superoxide dismutase will slow the process of aging by preventing free radicals from oxidizing sensitive biological molecules or reducing the formation of free radicals. The antioxidant chemicals found in many foods are frequently cited as the basis of claims for the benefits of a high intake of vegetables and fruits in the diet (Bjelakovic et al., 2004).

I view this hypothesis as the weakness of the theory, when pertaining to humans. Large randomized controlled trials have shown that antioxidants do not reduce the risk of cancer, heart disease, strokes or aging (Bjelakovic et al., 2004). My father-in-law, who died from cancer, had been eating fruits and vegetables containing all these antioxidants. He had also been taking all these antioxidants in a vitamin form for most time of his life, - but it did not help to prolong lifespan or prevent cancer. The reason for this might be due to the fact that dietary antioxidants, unlike natural antioxidants produced by cells, do not reach mitochondrial DNA, the primary site of radical oxygen damage, leaving this site susceptible to radical attack. But it can also be viewed as the strength of the theory, when pertaining to laboratory animals. Balin (1982) has reviewed the data derived from experiments done by Harman to test the free radical theory of aging both in vivo and in vitro. Evidence for the role of free radicals in ageing has been obtained from feeding antioxidants to laboratory animals. In a number of experiments with different strains of mice Harman reported up to 35 per cent increase in mean life expectancy but none of the compounds tested extended the maximum life span. The antioxidants were found to be most effective in increasing life expectancy of short lived strains of mice by delaying the development of specific pathologies, such as leukemia (Balin, 1982). But the experiments with the longer lived strain showed no effect of feeding antioxidants either on mean or maximum life span (Balin, 1982).

Another research which supports the free radical theory and testifies the importance of mitochondria in both aging and age-related diseases, is the research done by Tanaka and colleagues in 1998. Tanaka showed that nearly two-thirds of Japanese centenarians have a mitochondrial gene variant known as Mt5178A. And people who had that variant were more likely to survive to a hundred and were half as likely to be hospitalized for any age-related disease as people without the variant: a strong link between aging and age-related disease (Lane, 2003). The reason for that was hypothesized by the fact that the Mt5178A variant is associated with a low leakage of free radicals from mitochondria. Further work by Tanaka’s group in 2000 supported this hypothesis, showing that women with the Mt5178A variant had fewer mitochondrial DNA mutations in their oocytes, which suggests that the variant is indeed associated with less free-radical leakage (Lane, 2003).

To further support the theory of aging I have chosen, I would like to give you an example of my relatives who had the misfortune to live in northern Ukraine at the time, when an explosion at the Chernobyl nuclear power station happened. They lived far away from that area, but I’m convinced that the reason they died in their early seventies, one died from cancer and the other one – from cardiovascular disease, was that they were exposed to the radiation to some extent. Radiation is one of the environmental pollutants that increases the production of free radicals and increases the rate of damage. They were in their early sixties at that time, and it is known that with aging, the damage caused by free radicals occurs faster than the cells can repair themselves, and cell death occurs (Touhy & Jett, 2010).

Returning to the questions I posted in the beginning of my paper, I would like to summarize my thoughts about aging. The aging process happens during an individual's lifespan. We are all involved in this process and none can escape it. When one is young, aging is associated with growth, maturation, and discovery. Many human abilities peak before age 30, while other abilities continue to grow through life. The great majority of those over age 65 today are healthy, happy and fully independent. As nurses, we have to understand that there is considerable variation in the aging process. Not only is there variation between persons but also between the systems of any person. We must try to forget the stereotypes and look at older individuals as unique individuals, each with a particular set of resources and challenges.

Though, in general, the lessons are clear. Regular physical activity, a balanced diet, social involvement, moderate or no drinking, and no smoking, can significantly decelerate the aging process.

References

Balin, A.K. (1982). Testing the free radical theory of aging. In R.C. Adelman & G.S. Roth (Eds.), *Testing the theories of aging* (pp.137-182). Florida: CRC Press Inc.

Bjelakovic, G., Nikolova, D., Simonetti, R.G., Gluud, C. (2004). Antioxidant supplements for prevention of gastrointestinal cancers: a systematic review and meta-analysis. *Lancet 364 (9441)*, 1219–28.

Bonder,B.R., Haas,V.D.B., & Wagner,M.B. (2009). *Functional performance in older adults* (3rd ed.). Philadelphia, PA: F.A. Davis Company.

Burbank, P.M. (1986). Psychosocial theories of aging: a critical evaluation. *Advances in nursing science, 9 (1),* 73-86.

Lane, N. (2003). A unifying view of aging and disease: the double-agent theory. *Journal of theoretical biology* 225, 531-540.

Merry, B.J. (1987). Biological mechanisms of aging. *Eye 1,*163-170.

Touhy, T.A. & Jett, K.F. (2010). *Ebersole & Hess’ gerontological nursing & healthy aging* (3rd ed.). Missouri, St. Louis: Mosby Inc.