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"CALCULATING THE AGING PROCESS"

by
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Time is our most valuable and unique resource because it can only be used once, and unlike any of our other resources, it cannot be recycled, borrowed or saved. Most importantly, everyone accepts it as a given because it moves at the same rate day after day. Some have described it as a straightforward progression like steps on a ladder where one always follows another, as in minutes, hours and days. For these reasons time has been linked to the aging process. The rationale for this is the clock and how we count. Each day is just as long as every other and all of them have just 24 hours. Given this truism, we are led to believe that the amount of time that it takes to pass from one year to the next (except leap year) is always the same. What furthers this belief is the way we count the distance (hours, minutes, seconds) between each day and the next. Our reasoning is that hours lead to days, months and then years. Hence, we conclude that it must be linear. The most logical reason to believe all of this is that after 10 years, we all believe that we are 10 years older. It was this conclusion that led me to think about time and how we calculate the age of our dogs.

A little research on this subject led me to look beyond the obvious and into the world of other living organisms. There we find birth rates, adolescence and the aging process itself. For some organisms these periods are different rather than similar. Those who have lived through some of them already know that time does not always seem to be so linear. In other words, for some of us the distance between one year and the next was not always the same. As a child, some of our days took longer to pass than others. As an adult, these same days now seem to pass more quickly. I remember my mother saying, "It seems like just a few weeks ago it was spring and now it's almost Christmas". What's funny about all of this, is that now, I have begun to say some of these same things myself. Even our common expressions seem to confirm that time moves at different speeds and it seems to take on different meanings depending on our age. In the non-scientific world when people speak about time they then to associate it with their age and experiences. This could be why it seems to pass at different rates for each age group and whether they were having fun or dreading every minute of it.

Dr. DeePock Chopra a noted endochronologist wrote about how people can change their biological clock just by the way they view time. He speaks about the mind-body connection

and what science has learned about the aging process. Chopra reminds us that our body is constantly replacing its parts one by one but at different rates. We replace our skin each month and our heart and other organisms at different intervals. The body we lived in last year is not the same one we live in this year.

How people think about time and how they express it in conversation can not only affect their body but its many functions. For example, we can all remember meeting an old friend. If we had a really good time, we would say that "time flew by". On a recent flight that took six hours, I ran into an old friend and we began to catch up on things. When we arrived we were not even tired, we forgot to take a nap and kept on talking. Chopra addresses these kinds of events and reminds us that when people are enjoying themselves; time passes by in a "jiffy". When events are pleasant, we use phrases like; "our time just flew by". Chopra reminds us that we can actually alter our biology for sleep and reset our need to rest with just a thought. He points to examples of how our attitudes can influence these things. For example, when people describe their life in negative ways, with phrases like; "my time is running out", they also change their biology. These individuals via their thoughts are actually stressing their bodies by closely watching the clock. Their perception of time makes their biological clock run faster. As a result of their internal perception of time (which is running out), they tend to have a faster pulse. Their hormone and insulin levels are higher. Their blood pressure is elevated, they have a faster heart arrhythmia and their heart beats more times than normal each minute. While a newborn infant is not thinking about these things and has no notion of time, their biology also changes with age but for different reasons. After having lived one full year, they are just beginning to walk, while other mammals who were born on the same day can be fully developed and mature enough to become parents. These differences suggest that time may not be universal or linear for all species. Some believe that the aging process begins at birth and travels at a different pace each year thereafter for a lifetime. For these reasons we should question how the aging process is measured since it can vary within and between species and it can change pace depending on ones lifestyle, experiences, general health and attitude.

Researchers have changed their notion about time and how it passes. Advances made in the process of in-vitro fertilization (IVF) have moved time forward at a pace faster than anyone noticed. The first child born of frozen embryo was Zoe Leyland. Her birth occurred on March 28, 1984, in Melbourne, Australia. In 1997, Lesley and John Brown of Oldham, England gave birth to the first child conceived in a test tube. This was a shock to the world and it signaled the beginning of a new era in human reproduction. Today, the use of IVF has become such a wide spread practice that thousands of children are now being born each year using this technology. What we thought about reproduction and the time it took for a pregnancy to occur full term had been changed. Scientists have re-shaped our genetic destiny by shortening the nine months of pregnancy preceding a birth with the creation of artificial wombs. By 2000, the time an unborn child needed to be nurtured in the womb had been shortened from nine months to less than six. These changes have led to an increasing number of children who start their lives outside the human womb in petri dishes where, as embryonic cells, they divide and grow before implantation into their own or a surrogate mother's womb.

There is other evidence to suggest that what was thought to be the time required for certain things to occur had changed suggesting that for other species time may not necessarily pass at the same rate as it does for humans. One year in the life of a human is not the same as one year in the life of a puppy, a colt or a goldfish. Even the speed of a human heart beat changes with age. The resting rate for a newborn is 120 - 180 beats per minute. At one year, the rate changes to 100 - 130, at two it has slowed down to 90 - 120 and by eight years of age it is near that of a young adult, 70 - 120 beats per minute. The rate at which time passes and the speed with which each species develops, matures and dies is related in part to its genetics, but also to their nutrition, health care and their biological clock. Dr. Chopra and others remind us that our perception of time can also change body functions and the aging process just by the way we think.

In the year 2000, scientists revised the average life expectancy of humans. For women it was raised to 87 and for men it was raised to 80. But for the horse it remains about 25-30 years and for most breeds of dogs it is still about 10-12 years on the average. One can not help but notice that for most of the species on this planet, their life expectancy has remained unchanged for the past 150 years. Humans seem to be the one notable exception. The fact that humans have significantly extended their life expectancy by almost 50 years is worth some discussion. These extensions were not accomplished by slowing down growth or development at the beginning of life, but instead they were achieved by extending the number of years at the end of the life cycle. It is interesting to note that the one period of life that has not changed is the length of time that it takes to reach reproductive maturity. For most species including humans it still takes about the same amount of time to become biologically mature as it did 150 years ago.

Humans born after 1950 can now expect to live almost twice as long as their great-grandparents who lived in the early 1800's. Tables 1 and 2 compare and contrast the rate at which individuals pass through life.

TABLE 1. AGE POINTS IN YEARS FOR HUMANS

Born	Adolescence	Maturity	Middle Age	Old Age
1800	8	15	30	45
1900	12	20	45	60
2000	12	20	50	70

According to a report by the Merial Corporation (2001), dogs age more quickly in their early life than humans. Table 2, provides the age equivalents for dogs.

TABLE 2. AGE POINTS IN YEARS FOR CANINES

Born	Adolescence	Maturity	Middle Age	Old Age
1800	6 months	1	6	12
1900	6 months	1	6	12
2000	6 months	1	6	12

When compared, Tables 1 and 2 provide simple facts that have startling implications. The most obvious of which is that although a canine's life expectancy has not substantially changed over the past 200 years, humans have nearly doubled how long they can expect to live. For humans, the aging process has been extended because of the improvements that were made in the control of childhood diseases, health care and nutrition. The other factor affecting life expectancy is genetics and the capacity to reach the biological threshold. One's ability to adapt to a changing environment can also influence the aging process. In these areas, the animal kingdom has been less successful.

AGE, NOT LINEAR BUT RELATIVE

We grow up with the belief that time is linear rather than relative because we live in a physical world with clocks, calendars and birthdays. We know that diet; exercise, proper rest, and attitude all impact the aging process. A brief look at our early history provides some insight into this matter. Lets take the first seven Presidents of the United States beginning with George Washington, (born 1732) through President, Andrew Jackson, (born 1767). All seven presidents had different problems during their administrations and for one reason or another each of these men all lived considerably longer than other men of their time. They averaged an incredible 79.85 years which even by today's standards would have been exceptional. Perhaps their diet, early childhood care and experiences were better than others. But surely they had jobs with more built-in pressure, stress and tension than others. Could seven consecutive presidents all have had something in common that made this difference. While there is no direct way to measure their genetics, it seems clear that they may have had a superior genetic advantage. In the 1700 and 1800's, a 40-year-old man was considered to have passed the middle of his life and by 50 he had reached old age. If that same man had a 10-year-old dog, he was considered to have an old dog. In the year 2000, a 40-year-old man would only be approaching middle age but his 10-year-old dog would still be considered an old dog. The important difference between these two stories is not the dog, but what happened to the owner. The phrase "in man-years"... means the man's age. It was used as a way to measure and compare a man's age to that of his dog. Hence, the phrase, my dog is "70 man-years old" was calculated by using a formula that had been passed down from father to son. To compute the age of a dog in man-years, you were taught to multiply the dog's age by seven. In those days a 10-year-old dog could easily have outlived his master if the dog's age were converted into man-years using the old formula.

A new formula has been developed which is based on new information and a better

understanding of the aging process. We now know that the old formula was not correct because it assumed that each year of life was linear meaning that it was exactly the same year after year. With a new understanding of how time passes and with some knowledge about how each species develops and matures, we know that the aging process does not continue at the same pace year after year. Nor do all species grow, develop, and mature at the same rate. In Table 3, the old and new formulas show the conversion of a dog's age into man-years. What did not change between the old and new formula was the first year of life; it is still the equivalent of 15 or 16 man-years. But after that things begin to change. A two-year-old dog would be equivalent to a 24-year-old man; a three-year-old dog would be equivalent to a 28-year-old and so on. Using the new formula, a 10-year-old dog would be 52 man-years old, not 70 as the old formula suggested. The comparison between the old and new formula shows that linear time correctly applies to the clock and the calendar, but not as a way to measure the aging process. Using the old formula, it would be very risky to let a 70 year-old dog chase a Frisbee on a hot day. One would be less hesitant if it were a 52 year-old dog chasing the Frisbee on the same hot day.

TABLE 3. CANINE AGE CONVERTED TO MAN-YEARS

Chronological Age	1	2	3	4	5	6	7	8
Old Formula	15	7	7	7	7	7	7	7
New Formula	16	8	4	4	4	4	4	4

The reason for the change in the old formula is because we know that the aging process is affected by many factors not just the clock and the calendar. For example, diet, rest and health care for the younger members of a species are clearly different then those of the adults. How well these elements are managed plays a major role in the extension of their biological clock and their life expectancy. Why then are the canines today not living longer than those in the past? They are fed superior diets that are commercially produced using nearly perfect formulas. Puppies are being better-managed and fed superior rations. With all of these improvements there still has not been a significant improvement in their total life expectantly.

The problem may lie in the fact that they have already reached their biological threshold. For humans we know that it is 120 years, which means that for most of us we have not reached the genetic limit of what is possible. Because we have a genetic threshold of 120 years, managing stress, diet and exercise takes on a new meaning and explains why humans have been able too nearly double their life expectancy. Whether man will be able to extend the life of his best friend now seems to depend on how well science can be put to use. If their biological limit and there genetic threshold has already been reached, the potential for extending their life may require the use of new technologies and our creative ability to approach this subject with new ideas.

References:

Chopra, Deepak, Perfect Health, Hermony Books Inc., Crown Publishers Inc., NY, NY, 1991

Mohraman, Robert, "Canine Obesity", Ralston Purina Company, Checkerboard Square, St. Louis MO.

Paw Prints, Newsletter, Merial Corporation, 2001, p.8

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Dr. Battaglia is also a popular guest on TV and radio talk shows having appeared several times on animal planet. His seminars on breeding better dogs, selecting sires and choosing puppies have been well received by breed clubs. Those interested in learning more about his seminars and articles should visit the website <http://www.breedingbetterdogs.com>