

JPJRS 9/2 ISSN 0972-3331, Jul 2006 21-35

DOI: 10.5281/zenodo.4284870

Stable URL: <https://doi.org/10.5281/zenodo.4284870>

Death: Biology and Beyond?

Ramesh Bijlani

Sri Aurobindo Ashram, Delhi Branch, New Delhi 110016

Abstract: Life is a mysterious phenomenon, and so is death. Clinical death is now defined as the permanent and irreversible cessation of function of any one of the three interconnected vital systems, viz. nervous system, circulatory system and respiratory system. Even after a person is no longer alive, individual cells and tissues remain viable for variable periods of time, making their transplantation possible. Physiologically, death represents failure of the homeostatic mechanisms. Cell death by necrosis as well as apoptosis is a regular phenomenon, but the organism continues to be alive due to replacement of cells. However, a point is reached when replacement and physiological reserve are unable to compensate for deterioration due to aging. Impairment of function beyond a point in one or more vital organs results in the death of the whole organism. The Mother (of Sri Aurobindo Ashram) described death as the “decentralization and dispersion of cells”. At the mental level, the replacement of the ‘will to live’ by a ‘wish to die’ is probably the beginning of decentralization. Decentralization is followed by ill-health, and finally death. Following death, dispersion of cells possibly transmits their consciousness to the new forms they assume. On the purely material plane, the time of death is inexorably fixed. But on higher planes of consciousness, a different type of determinism prevails. That is why the will to live, or its absence, may have a role in determining the time of death. Psychoneuroimmunology provides some partial but plausible explanations for the phenomenon. Death is both a physiological and a spiritual necessity. Physiologically, death is nature’s solution for the imperfection of the body. When the body has exhausted its functional span, it is withdrawn, usually only after it has renewed itself by reproduction. Thus the old order keeps yielding to the new. Death is also a spiritual necessity because the true purpose of life is spiritual growth. When a person reaches the upper limit of his spiritual growth, further prolongation of life becomes meaningless.

Keywords: Aurobindo, Cell death, Clinical death, molecular death, Psychoneuroimmunology, somatic death.

Death is both an event and a process. It is an event after which a collection of matter that was once alive becomes just a collection of matter. Nobody has seen what it is that escapes from the living body during this radical transformation. That is why the phenomenon called life is shrouded in mystery. It naturally follows that the event during which it escapes is equally mysterious. But the event called death is the culmination of a process from which it cannot be divorced, viz., the process of aging.

In a broad sense, aging is a continuous process which begins with conception and ends with death. But what is more relevant to death is the impairment of functions seen in the later part of life. In this restricted sense, aging is due to a decrease in the efficiency of homeostatic mechanisms. Hence the body is unable to mount an adequate response to the challenges originating in the external or internal environment. This increases the vulnerability of the individual to a number of diseases, to one of which he finally succumbs during the event called death. Although progress towards the event of death may be a slow and insidious process, the event is precipitated when the functional capacity of at least one of the vital organs falls below a critical minimum. When that happens, the heart stops beating or the lungs stop breathing. In either case, the result is that no part of the body any longer has a continuous supply of oxygen. However, modern technology may create situations which are not so clear cut. The lungs may be made to work like bellows by mechanical means in a person who is unlikely to be ever able to regain meaningful life. That is what has necessitated the concept of brain death. If all the features of brain death are present, it is no longer justified to continue artificial life support. But since artificial life support may maintain a large number of organs in a viable state long after brain death, these organs are still fit to be transplanted where they can continue to live in another body.

Clinical Death

Doctors know very little about death. The only course in which they learn the subject at some length is that on forensic medicine. This is so because it is commonly assumed that their job is to postpone death as much as possible. If in spite of their efforts a patient dies, it signifies their failure, and they are out of the picture except perhaps to answer, in some cases, unpleasant medico-legal questions such as the time of death or the cause of death. That is why in case of incurable fatal disease, doctors are often unwilling to face the issue. They avoid talking about impending death to the patient or his relatives. They are ill equipped to talk to them in a manner that would make acceptance of the inevitable easier. Instead, they hide their distaste for death behind a cloak of intense activity. In the pre-ICU days, the parting service to the patient often was cardiopulmonary resuscitation and intracardiac adrenaline. These days, the patient is transferred to the intensive care unit (ICU) where tubes, flashes and beeps occupy the attention of doctors and nurses more than the patient to whom the equipment is connected. It is only recently that the importance of facing the issue of dying has been recognized, and some attention given to the best way of doing so (1). But this new trend is yet to get reflected in medical curricula.

Pronouncing clinical death

Till about forty years ago, the boundary between life and death was clinically well-defined. Death was defined as total stoppage of the circulation of the blood, and a consequent cessation of the animal and vital functions, such as respiration and pulsation (2). Doctors pronounced death when respiration and heartbeat had ceased, and when it seemed certain that these functions would not start and could not be started again (3). This could be presumed if heartbeat and breathing remained absent for at least 10 minutes because the brain survives without oxygen supply for only about 3 minutes, and without a living brain, resumption of circulation and respiration are impossible. But now that respiration and circulation can be maintained artificially for long periods of time, brain death has become an important criterion of death. Now death is defined as the permanent and irreversible cessation of function of any one of the

three interconnected vital systems, viz. nervous system, circulatory system and respiratory system (3). If any one of these systems fails, the other two also fail because the three systems are interlinked. The criteria of brain death are (a) fixed, dilated pupils, unresponsive to light, (b) absence of corneal reflex, vestibulo-ocular reflex, and cough reflex, (c) absence of cranial motor nerve responses to painful stimuli, (d) inability to breathe when the mechanical assistance provided by the ventilator is withdrawn temporarily, (e) coma and inability to breathe spontaneously continuously for at least 6 hours, (f) EEG silence continuously for at least 30 minutes. EEG silence is defined as absence of electrical potentials over 2 microvolts from symmetrically placed electrode pairs over 10 cm apart and with an interelectrode resistance between 100 and 10,000 ohms (4). However, very few countries insist that an EEG be available for determining brain death: clinical criteria are considered adequate. Being an expensive facility, EEG cannot be done in every hospital. Brain death has to be certified by a team of doctors consisting of a neurologist, anaesthesiologist and an experienced doctor of the intensive care unit of the hospital. The patient should be examined by the team at least twice at an interval of 6-12 hours. Further, none of the members of the team should have any interest in transplantation of an organ from the patient.

The criteria of brain death have become necessary because artificial life support systems can today keep intact in several patients the two cardinal signs of life, heartbeat and breathing, for several months after all reasonable hope of resuscitation has disappeared. Technology can thus maintain semblance of life when the person is not alive any more. Therefore additional criteria are needed to determine the point at which hope may be abandoned, and support systems switched off. On the other hand, strict guidelines for certifying brain death are also necessary because artificial life support can keep several organs in the body fit for transplantation for several hours after the person as a whole is, for all practical purposes, dead.

Somatic death and molecular death

Somatic death is said to have occurred when the person as a whole is no longer alive. The criteria of clinical death refer to somatic

death. After somatic death, maintaining oxygen supply through artificial life support can keep several organs alive for long periods as discussed above. But even if no artificial life support is used, the cells in different organs and tissues stay alive for variable periods of time after somatic death. Death of the cells is called cellular or molecular death. In general, molecular death occurs the earliest in organs which have the richest blood supply during life. Brain cells undergo molecular death within 5 minutes of somatic death, and muscle cells after about one hour, but blood cells and cornea are alive even 5 hours after somatic death. That is one reason why the brain cannot be transplanted; an organ can be transplanted only before it has undergone molecular death.

Suspended animation

Suspended animation is a state of extreme reduction in metabolic activity. The person may appear dead but the bare minimum metabolic activity is still going on throughout the body, and the person can return to normal activity. Some yogis can achieve a marked reduction in metabolic activity voluntarily, and thereby stay alive for relatively long periods in a place with highly restricted oxygen supply, such as an underground pit. One such yogi was examined by Prof. B.K. Anand and his colleagues at the All India Institute of Medical Sciences. The yogi could bring down his metabolic rate to about half the 'normal' resting metabolic rate (5). A similar state is achieved clinically when hypothermia is induced to facilitate certain surgical procedures. Sometimes a person goes into suspended animation after drowning or electrocution. A person exposed to extreme cold may sometimes have all the signs of clinical death, but may revive after rewarming. The dictum in such cases is that the patient is not dead unless warm and dead.

The Process of Death

Life is maintained in complex multicellular organisms like a human being by a delicate balance of homeostatic mechanisms which ensure optimal conditions for the functioning of all cells of the body. In view of the complexity of the homeostatic mechanisms that maintain life, it is not surprising that sooner or later something goes

wrong at some crucial point, and life comes to an end. What is more surprising is that this happens after such a long time. One of the keys to our long life span is provided by the basic units of life – the cells. Most cells of the body have a life span much shorter than the organism to which they belong. But the process of cell division ensures that new cells replace the cells that die. The process of replacement is so exact that we do not notice the turnover and treat an individual as a stable entity. Imagine a machine from which only a few parts are removed at a time, replaced promptly, and then a few more parts removed from elsewhere, again replaced promptly, and so on. Soon a time will come when all the old parts have been replaced by new ones. In effect, what we have is a new machine but we remain under the illusion that it is the same old machine!

Cell Death

Cells may die due to an injury or poison. Cell death in this fashion is called necrosis. Cells, which undergo necrosis, swell and burst. However, what has engaged the attention of scientists very intensively during the last 25 years is programmed cell death, or apoptosis (pronounced *app-oh-toe-sis*). It seems that a cell normally generates a variety of molecules, some of which send survival signals while others send death signals to the cell. So long as survival signals dominate, the cell stays alive. Dominance of death signals triggers apoptosis. This mode of apoptosis has been termed cell 'suicide'. Cell death by a similar mechanism may be triggered also by toxic substances generated by neighbouring cells, e.g. by cytokines released by immune cells. This mode of apoptosis has been termed 'murder'. Neighbouring cells do not necessarily send lethal substances. They may also send trophic factors, e.g. the trophic factors released by nerve cells which keep neighbouring nerve cells, or the muscle cells which they innervate, alive.

Various regulators of cell death act through a series of chain reactions affecting genetic expression of some proteins, which in turn may eventually activate enzymes called caspases. Caspases are the final mediators of the apoptotic pathway. These enzymes break down protein molecules. Their name is based on the fact that they

selectively cleave protein molecules at sites just C-terminal to aspartate residues. Caspases target proteins of the nuclear lamina and cytoskeleton. Attack on these critical structures eventually leads to cell death (6).

Why do cells have to die?

Using oxygen increases markedly the amount of energy that can be obtained from nutrient substrates. But it is also associated with the formation of reactive oxygen species which can damage the cells by attacking fats, proteins and nucleic acids. Although various defence mechanisms against oxidative damage have been built into cells, some damage does occur. Such damage is cumulative, and seems to be one of the contributors to the process of aging. It seems a stage finally comes in the life of a cell when the damage reaches such a level that further survival of the cell would not be in the best interests of the body as a whole. At this stage some unknown trigger triggers the apoptotic pathway, leading to cell 'suicide'. Some healthy cells may also undergo apoptosis, e.g. during embryonic life to sculpt tissues into a specific shape. Thus normal cells have no hesitation in quitting when no longer needed, or when their survival is no longer in the interest of the body as a whole.

Relationship between death and cell death

If cell death is a well regulated process, and dying cells are replaced by new cells, why does the organism die? This happens because the situation is a little more complex. We live in a hostile, competitive environment. A variety of chemical, physical and biological agents threaten our existence. The reason why we still survive is because responding to these agents is a part of the cellular defence mechanisms. If the challenge is overwhelming, or the response is inadequate, more cells may die than can be replaced. Inadequate response is a part of the process of aging. Even in the absence of an external onslaught, there may be apparently spontaneous abnormalities, which occur more frequently with aging. These changes may be: first, inadequate replacement of dead cells (atrophy); second, replacement by inadequately or inappropriately functioning cells (degeneration or scarring); or third, transformation

into neoplastic (cancer) cells. When such changes take place in any part of the body, initially nothing wrong may be observed because of the enormous physiological reserve. If the physiological reserve is exhausted, the impact depends on the organ involved and the degree of involvement. Impairment of function beyond a point in one or more vital organs results in death of the whole organism.

Death in unicellular organisms

In unicellular organisms, death is not a clearly discernible event. The reason is that long before the cell accumulates enough damage to die, it divides. The division results in two identical cells, each of them exactly like the parent cell. Since the parent is indistinguishable from the progeny, and very large numbers of such cells may be produced before some of them die, it is impossible to say when the parent cell died. This argument applies not only to unicellular organisms but to some extent to all organisms reproducing asexually. One may like to speculate that if asexual reproduction guarantees virtual (not real) immortality, why sexual reproduction evolved at all. Sexual reproduction makes it possible for the progeny to be different from the parents. The possibility of progeny improving upon the parents facilitates evolution. One might say that asexual reproduction is like photocopying while sexual reproduction is a creative art.

Beyond Biology

The Mother (of Sri Aurobindo Ashram) described death as the “decentralization and dispersion of the cells which make up the physical body” (7). In a very significant elaboration, She has also said “Death is the decentralization of the consciousness contained in the body’s cells” (8). To clarify what She possibly meant, the Supreme Consciousness expresses itself in the universe in diverse forms. Each form expresses the universal Consciousness to varying degrees. Although the level of expression differs, every atom has a consciousness, every cell has a consciousness, and every individual has a consciousness. During much of the lifetime of an individual,

the consciousness of each cell is centred around the consciousness of the individual. But there comes a time when the centralization is weakened. As the Mother says. “the central will of the physical being abdicates its will to hold all the cells together ... it is this which inevitably precedes death” (7).

In order to understand why and when the process of decentralization begins, one may turn to what happens before decentralization. The consciousness of the individual is not static during life. Its ultimate destiny is to meet its source, or to express the Supreme Consciousness or the Universal Spirit completely. A few shuffling steps are taken in that direction during life; a sadhak on the path of yoga may put in a few extra strides. These steps are taken using the body as an instrument. As a result of these steps, there is a growth in the consciousness of the individual. But due to the limited plasticity of the body, further growth of consciousness is not possible while retaining the same body. The body which served as an instrument for growth of consciousness now becomes a bar to further growth. It is possibly when the material form becomes inadequate for responding to the pressure for further growth of consciousness that there develops, in the words of the Mother, “a kind of disgust with continuing the effort of coordination and harmonisation” (7). The “central will” to retain a collective consciousness gives way to decentralization of the individual consciousness of each cell. At the mental level, the replacement of the ‘will to live’ by a ‘wish to die’ is probably the beginning of decentralization. Decentralization is followed by ill-health, and finally death. Death is followed by dissolution of the body, leading to dispersion of cells. Eventually, the cells also dissolve, leading to dispersion of the atoms which compose them. The atoms may regroup themselves into new cells. The new cells may regroup into a new body.

A spiritual understanding of the process of death, as provided by the Mother in terms of decentralization and dispersion of cells, throws some light on the purpose of life. During the limited life span of an individual, growth of consciousness achieved by the individual leaves an imprint on the matter composing the body. Dispersion of cells possibly transmits the new level of consciousness to the new forms

it assumes. In the words of the Mother, “It is the consciousness of the cells that enters other combinations” (7).

In keeping with the trends of our times, a question is likely to be raised regarding the scientific validity of decentralization and dispersion of cells. Before we attempt to answer any such question, we need to remind ourselves that first, scientific truths are limited by the presumptions and methods of science; second, spiritual truths are wider and higher than scientific truths; and finally, seeing spiritual truths requires methods which are available to all but cultivated by very few. In short, a spiritual truth may not fit into the mould of science, simply because the whole cannot belong to a part. Having said that, the tendency of the central will to hold all the cells of the body together during life may be partly reflected in the single aim towards which all cells in the body work, i.e. to maintain homeostasis. Some cells replenish oxygen, some replenish food material, some remove waste products, while some coordinate the activities of all the rest, but all these individual functions are merely contributions towards the one common goal of maintaining homeostasis in the body as a whole. The beginning of ill health is a breakdown in the harmony between the activities of different parts of the body, leading to derangement in homeostasis. The breakdown in harmony may be a reflection of the decentralization of cells. The dispersion and dissolution of cells and consequent dissemination of a new level of consciousness after death of the individual are issues beyond the competence of science to examine and comment upon. However, if a parallel may be drawn, there seems to be a correspondence with the law of conservation. Not only matter and energy but also the soul of the individual seems to follow this law. They are all equally indestructible. Just as the matter belonging to an individual is recycled, his spiritual element represented by the soul is also recycled. Neither the material body nor the soul are destroyed, but both are recycled and enter new temporary consolidations which we call individuals. Body is consolidated matter, and the soul is consolidated Spirit.

At the birth of an individual, matter manifests the Spirit; during life, matter serves as an instrument of the Spirit; after death, matter

serves as a vehicle for dissemination of the Spirit. If the life has been used for the growth of consciousness, the disseminated matter manifests the Spirit less imperfectly than at birth.

The Time of Death

It is commonly held without any evidence, but with great conviction, that the time of death is fixed right at the time of birth, and that nothing can be done to change it. It is also commonly believed, with some evidence, but with far less conviction, that a person can delay or hasten his death if he strongly wants it. When asked to clarify this issue, the Mother has emphasized the spiritual dictum that we live in a deterministic universe, but qualified it by saying that there are different layers of determinism. On the purely material plane, the time of death is inexorably fixed. But if one rises to a higher plane of consciousness, a different type of determinism prevails. At higher planes, the determinism looks like free will, although there is nothing like free will in the universe. It is just that the laws that govern the higher planes are different: creating an illusion of free will is a part of those laws. To give an analogy, the computer sometimes seems to think and behave intelligently. But in fact the computer can neither think nor has any intelligence. Its behaviour is exactly as determined by the programmer. In the same way, we act exactly as determined by our Programmer (the Divine), but seem to possess free will. The semblance of free will is inherent in the programme. There is plenty of anecdotal evidence for seeming free will in relation to the time of death. Benefitting apparently from a strong will to live and confidence in self-healing, patients with incurable cancers often defy all statistics and live much longer than expected. More commonly, patients sometimes live for a few weeks or months after all hope is lost as if merely to reach a milestone such as a birthday or a child's wedding. Still more commonly, patients go steadily downhill in spite of all treatment once they have lost the will to live. Nothing seems to help once the patient has given in or given up. A significant determinant of the course of an illness are the 'live' or 'die' signals generated by the patient himself, depending on the attitude of the patient to the disease in particular, and to life in general. Psychoneuroimmunology (9) now has some partial but

plausible explanations for these phenomena. The spiritual explanation provided by the Mother is that a person does not die till he gives his consent, maybe only for “the hundredth part of a second”. As She says, there is always something in the person which, out of fatigue or disgust, says: “Well, Ah! Let it be finished, so much the better”(10).

Premonition of Death

Support for the validity of a premonition of death is generally cited in terms of positive cases looked at retrospectively. This is indefensible because the process neglects the large number of cases in which the premonition is not followed by death. It is possible that even an unbiased study might detect that the premonition is followed by death more frequently than can be accounted for purely by chance. But that could be another way of looking at the loss of the will to live. If a person loses the will to live, he is likely to also get a premonition of death because nobody is immune to wishful thinking, especially in a helpless state. Psychoneuroimmunology provides a limited biological explanation for the march towards death being accelerated by loss of the will to live.

Life and Death

Two interesting questions, to which there can be both physiological and spiritual answers, are whether death is a reality and whether death is necessary. Physiologically, death is only a partial reality because a bit of the protoplasm continues to live, even after death, in the progeny. Physiologically, death is also necessary for getting around the problem of imperfection of the body. The body, like any machine, cannot function for ever. Therefore renewal by reproduction has got to be coupled with death, the old order yielding to the new. Thus reproduction and death are two sides of the same coin and are designed to keep open the possibility of the evolution of better, less imperfect forms of life.

Spiritually speaking, the answers are similar although the arguments are different and deeper. Death is a partial reality because it results in breaking up of one form of life for reconstruction into

new forms. Nothing may perish, but the configuration existing before death ceases to exist. Recycling, reconstruction and renewal are the basic features of life. As Sri Aurobindo says, "... ... individual life is a particular play of energy specialized to constitute, maintain, energise and finally to dissolve when its utility is over, one of the myriad forms which all serve, each in its own place, time and scope, the whole play of the universe" (11). It is commonly assumed that at least the soul is immortal. But on that also Sri Aurobindo has given a valuable clarification. He says, "... when we insist on the soul's undying existence, what is meant is the survival after death of a definite unchanging personality which was and will always remain the same throughout eternity. It is the very imperfect superficial "I" of the moment, evidently regarded by Nature as a temporary form and not worth preservation, for which we demand this stupendous right to survival and immortality. It is that secret Spirit or divinity of Self in us which is imperishable, because it is unborn and eternal" (12). Thus it is only the divine Spirit which is immortal, not the entire configuration of the individual. Immortality of the soul resides in the fact that it is a projection of the divine Spirit.

Spiritually speaking, death is also a necessity. The manifest universe expresses the Supreme Consciousness only in a rudimentary form. Matter expresses so little of It as to seem Inconscient. Man expresses It better than any other form in the universe known to us, but still falls far short of full expression. Man is probably the only creature who can achieve significant growth of consciousness during life. But due to the inherent inertia of matter, there comes a point when the physical body cannot respond any further to the thrust for further growth of consciousness. At that point, it becomes necessary for the body to disintegrate, and death provides the mechanisms for fulfilling the necessity. It is interesting that the mere knowledge that death is inevitable ensures some growth of consciousness. All religious and spiritual traditions goad us to mend our ways. We often ignore these exhortations, but in old age, when the inevitable seems close, we turn to spirituality. The growth of consciousness a person may achieve in the short period between getting a terminal illness and death may exceed the growth achieved in the entire life before the illness.¹ Not only the person who is ill, many of those who take

care of him or come in close contact with him during the illness may also experience a similar surge of spiritual growth.

Death is Nature's answer to two properties of matter: its tendency to decay; and its inability to respond, beyond a point, to the demands of spiritual growth. Out of the two, the latter is a deeper reason why death is necessary. As Sri Aurobindo says, "Even if Science were to discover the necessary conditions or means for an indefinite survival of the body, still, if the body could not adapt itself so as to become a fit instrument of expression for the inner growth, the soul would find some way to abandon it and pass on to a new incarnation. The material or physical causes of death are not its true causes; its true inmost reason is the spiritual necessity for the evolution of a new being" (12).

The culmination of the process is that a dying person invariably speaks the truth. That is why, the dying declaration holds immense credibility in law.

References

1. Kubler-Ross E. *On Death and Dying*. New York: Touchstone, 1997.
2. Spitz WU, Fisher RS (Editors). *Medicolegal Investigation of Death: guidelines for the application of pathology to crime investigation*. Springfield, Illinois: Charles C. Thomas, 2nd edition, 1980, p. 12.
3. Nandy A. *Principles of Forensic Medicine*. Calcutta: New Central Book Agency, 2nd edition, 2000, p. 133.
4. Bijlani RL. *Understanding Medical Physiology*. New Delhi: Jaypee, 3rd edition, 2004, p. 849.
5. Anand BK, Chhina GS, Singh B. Studies on Shri Ramanand Yogi during his stay in an airtight box. *Indian J Med Res* 1961; 49: 82-89.
6. Lodish H, Berk A, Zipursky SL, Matsudaira P, Baltimore D, Darnell J. *Molecular Cell Biology*. New York: W.H. Freeman, 4th edition, 2000, pp. 1044-1051.
7. The Mother. *Collected Works of the Mother, Volume 12*. Pondicherry: Sri Aurobindo Ashram, 1978, pp. 343-345.
8. The Mother. *Mother's Agenda, Volume 10*. Paris; Institut de Reserches Evolutives, 1998, p. 475.

9. Kiecolt-Glaser JK, McGuire L, Robles TF, Glaser R. Emotions, morbidity, and mortality: new perspectives from psychoneuroimmunology. *Annu Rev Psychol* 2002; 53:83-107.
10. The Mother. *Collected Works of the Mother, Volume 5*. Pondicherry: Sri Aurobindo Ashram, 1976, p. 138.
11. Sri Aurobindo. *The Life Divine*. Pondicherry: Sri Aurobindo Ashram, 5th edition, 1970, p. 192.
12. Sri Aurobindo. *The Life Divine*. Pondicherry: Sri Aurobindo Ashram, 5th edition, 1970, pp. 821-822.

Dr. R.L. Bijlani was Professor and Head of the Department of Physiology at All India Institute of Medical Sciences, New Delhi.

Death: A Molecular Definition

C. S. Paulose and Binoy Joseph

Centre for Neuroscience, Dept. of Biotechnology, Cochin
University of Science & Technology, Cochin – 682 022,

Abstract: This article tries to understand and define death scientifically. Today's scientific development of Cardiopulmonary Resuscitation and prompt defibrillation posed a challenge, rendering the previous definition inadequate. This general definition of death is now called "clinical death", and even after it occurs, breathing and heart beat may be restarted in some cases. Events which were causally linked to death in the past are now prevented from having an effect; even without a functioning heart and lungs, a person can be sustained with life-support devices. In addition to such extremes, a growing number of people would die quickly if their organ transplants or cardiac pacemakers failed. The author explains in detail the phenomenon of Apoptosis and describes scientifically the phenomenon of death.

Keywords: Apoptosis, brain death, Cell death, DNA, RNA.

Death is the full cessation of vital functions in the biological life. Generally death is defined as the cessation of heart beat (cardiac arrest) and of breathing. The development of Cardiopulmonary Resuscitation (CPR) and prompt defibrillation posed a challenge, rendering the previous definition inadequate. This general definition of death is now called "clinical death", and even after it occurs, breathing and heart beat may be restarted in some cases. Events which were causally linked to death in the past are now prevented from having an effect; even without a functioning heart and lungs, a person can be sustained with life-support devices. In addition to such extremes, a growing number of people would die quickly if their organ transplants or cardiac pacemakers failed.