

the effect of a misfolded protein on cell functionality

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Before delving into the discussion of whether protein folding helps cellular stress or not, a brief overview will be given regarding what protein folding is. Protein folding takes place at the cellular part which is known as the endoplasmic reticulum (Watson and Preedy). It should be noted that protein folding is a crucial procedure as the proteins fold themselves in a particular shape that allows them to perform their functions accurately.

Initially, the protein is present in the form of uncoiled strands that are in a random shape (Dobson). The random coil is synthesized by the ribosome and takes the shape of a three-dimensional arrangement. However, if the process goes wrong, and the proteins do not fold in a three-dimensional manner, then such a protein becomes the source of various diseases (Watson and Preedy). Such a protein is referred to as a misfolded protein (Watson and Preedy).

Having discussed the outcome of a misfolded protein, it should be noted that the cells are dependent on a sensitive system, which is termed the unfolded protein response (Watson and Preedy). Such reliance is based on the cell's function to protect against the cellular stress that can be caused by the process of protein folding. The unfolded protein response ensures the cell is appropriately secreting proteins (Watson and Preedy). In addition to this, the unfolded protein response also plays a role in activating genes that help the endoplasmic reticulum properly fold the proteins (Watson and Preedy). When the genes are activated, the cells are better prepared to manage the stress that might arise due to protein folding issues. However, an important aspect to note is that the severity of stress can devastate the unfolding protein response, ultimately leading to abnormal cell functionality (Watson and Preedy).

Aside from the process of protein folding, an important aspect to be noted is that the unfolded protein response acts as a cellular stress passageway as it both stimulates and destroys the death receptor five protein. This process can either result in promoting a cell towards suicide, or it can prevent the destruction of the cell. Scientists have observed a situation in which the stress created by folding protein had been initially blocked by the unfolded protein response (Elmore). The cells were given a chance to adapt, however, in case of persistence, the stress can lead to a process called apoptosis which involves the death of cells (Elmore). It has also been observed that if the process of protein folding goes wrong then the unfolded protein accumulates, forming a cluster, which stresses the endoplasmic reticulum. The stress in the endoplasmic reticulum, in turn, activates the unfolded protein response, leading to the increased production of the protein folding process, along with the degradation of the unfolded proteins.

Additionally, cells can react to stress in various ways, from the instigation of the survival act to the

commencement of a cell's death (Welch). The latter process leads to the eradication of impaired cells. Moreover, the amount of stress a cell can tolerate depends highly on the nature and the time period of the stress and the type of cell that is under stress (Welch). Another factor that determines the outcome of being put under stress is the response that is exhibited by the cells. The process of apoptosis, as mentioned previously, also depends on how much stress a cell can endure before it ultimately dies (Welch). Thus, cellular stress responses have numerous consequences, such as the positive response in which the cell exhibits the heat shock response. Another positive response is seen to take place in the unfolded protein response, which causes an escalation of the process of protein folding capacity, thereby neutralizing all the stress and increasing the chances of cell survival. Adapting to stress in a positive way defines the fate of a cell (Welch). A cell's defense mechanism and survival strategies are activated according to the level and the type of stress that it is faced with. If these strategies turn out to be unsuccessful, then the cell death functions are activated by eradicating the damaged cells from the organism.

From the above discussion, it is evident that the adaption capability of a cell largely depends on how it reacts to the stress that is imposed on it. The process of protein folding is crucial as it turns the protein into a three-dimensional structure that becomes capable of performing specific activities in the organism. If the process goes wrong, and the protein does not take the accurate form, then it becomes problematic as its presence can cause a number of diseases in the organism. The protein folding process takes place in the endoplasmic reticulum, and the creation of unfolded proteins can form a cluster inside the endoplasmic reticulum, leading to stress. The responses that the cell exhibit towards stress greatly depends on the nature and the type of cell. The stress can have a positive outcome if the cell's survival mechanism is activated, which helps in neutralizing the stress. However, if the survival mechanism fails, then the unfolded protein response activates the cell suicide mode in which the damaged cells are eliminated from within the organism. Therefore, the adaption nature of a cell depends on its defensive mechanisms.

Works Cited

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