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Editorial

Enzyme Inactivation Method: Effects and Steps to Do

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An enzyme is a special biological molecule that activates and controls (catalyzes) all metabolic processes in the cell. Each enzyme per process, independent and unique. Based on these properties, enzymes are used for different purposes. For example, if we want to stop or control a certain process, we can inactivate a specific enzyme. There are some difficulties when we do this work are:

- Find the right enzyme and
- Find a way to inactivate the enzyme.

To date, science has known hundreds of thousands of different enzymes involved in hundreds of thousands of different biochemical reactions. Enzymes are divided into three categories: pure protein, cofactor enzyme and coenzyme.

- The first is an independent protein molecule with a catalytic function;
- The second type of cofactor enzyme is a combination of a protein molecule and a metal ion as a cofactor. The protein molecule is the matrix and the metal ion has the catalytic function;
- The third type of coenzyme is a protein molecule that combines with a certain vitamin. Vitamins activate the catalytic function of enzymes.

The commonly used enzyme inactivation method so far has been to look for natural or artificial inhibitors and keep them to occupy the enzyme active site of all three of the aforementioned enzymes. This region is where the substrates are brought to assemble into the correct stereoselective conformation of the enzyme and through which they react with the enzyme to form a product. After this process the enzyme is conserved. When inhibitors occupy the active site, the substrates required for the biochemical reaction are displaced and no product is formed. Some metabolic process is disturbed. The difficulty and the only weakness of this inactivation method is finding the right inhibitor that fits the active site in the enzyme stereochemistry. There have been many studies to find these inhibitors, with very few successes, many failures. Most are incomplete inhibitions and have very large side effects, it is possible that the desired enzyme is not inactivated, but inactivates other enzymes.

Inactivation of coenzymes seems easier, just don't provide vitamins related to that enzyme. Here is the reverse process, when a restricted metabolism will cause some kind of disease of unknown cause, one can attribute it to a lack of essential substances - vitamins, Therefore, the usual treatment is to supplement vitamins either individually, if known correctly, or in groups: A, B, C, D ... or the simplest is to add all available vitamins - synthetic vitamins -complex vitamins have been formulated.

This article covers more about how to inactivate cofactor enzymes. It is common to use competitive reactions to replace metal ions in a desired compound on the grounds that elements from the same group in the periodic table will have the same valency, but different chemical affinities. The most difficult part of enzyme cofactor inactivation is not using competitive covalent reactions because the linkage in enzyme cofactor is unique and irreplaceable. So far, cofactor enzyme inactivation has been impossible. Although the role of cofactor enzymes in the most important metabolic pro-

cesses is well known. For example, DNA cloning, RNA cloning and providing energy (ATP) to cells and many other processes. Fortunately, radioisotopes can do this.

Cofactor enzymes accept metal ions as a cofactor in a stable isotopic assembly. For example, Mg ion is a combination of three isotopes Mg-24, Mg-25 and Mg-26. These compounds are isotopically indistinguishable, as long as they are divalent Mg ions. Taking advantage of this property, it is possible to use a radioisotope to replace the stable metal ion in the enzyme cofactor. As a rule, enzymes are not available in the cell fluid, but the raw materials for making enzymes are always available in the form of components, it is only created when the cell needs to metabolize a certain process. Therefore, when supplying the radioisotope, the cell considers and uses it as an enzyme constitutive material when needed. This radioisotope will be the cofactor when forming the cofactor enzyme. Of course, this isotope will decay according to its nuclear properties with a certain half-life. On decay they turn into other elements and thus the enzyme cofactor is inactivated. Due to the need for metabolism, the cell again forms a new cofactor enzyme that still contains the radioisotope. This process ends only when the necessary radioactive isotopes are exhausted. But, once cells need metabolism, they draw the necessary elements from the body's reserves through the blood or, if needed, from food. It is not difficult to understand, when people lack a certain substance, people crave a certain food. This is most obvious in cancer patients, still eating normally, but the body is losing weight day by day. The reason is that cancer cells grow so fast that they need a lot of energy and need metabolic enzymes. They create their own blood vessel system to use. They draw all the substrates, nutrients and, of course, metal ions from all over the tumor. Therefore, the delivery of radioisotopes for the cell to make cofactor enzymes is a possible method.

When decaying, in addition to inactivating the enzyme cofactor, radioactive isotopes will irradiate cells right at the target, irradiation will damage the cell structure, generating free radicals along the radiation trajectory. These free radicals, again, disrupt the metabolic processes in the cell. All these effects occur simultaneously, at the target site where the enzyme cofactors are located, and of course in the cell where they are present. This may cause the harmful effect of radiation on healthy cells, but it is beneficial when we need to treat a certain disease including cancer and SARS COV2.

The problem here is to choose the enzyme cofactor and which radioisotope to go with it and the next steps to perfect this method. All of these questions have been presented in three works published in three chapters 1, 2 and 19 of the books: Highlight on medicine and medical sciences, vol. 15.

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