

Enzymes – Case Study HIV

Patient X returned home for summer at the end of his freshman year at college. Like many freshman, he had had a few ups and downs his first year in college. He went from being an all-star, honor roll student in high school to a small fish in a very big pond at college. He compensated by embracing the party culture, he made lots of friends, spent many nights out of his dorm and ultimately his grades suffered. By the end of his freshman year he started to realize he couldn't maintain this party pace and if he did he would flunk out. He examined his goals and reset his priorities deciding if he made it through the year, his sophomore year would be better.

At home his mother was worried about him. She was hoping he would have time in the summer to think about his future. His mom noticed a rash on his upper chest, arm and shoulder and asked him about it. He said it had been there a week or two. It didn't itch or anything so he wasn't worried about it. He had been feeling a little under the weather a week or two before and the rash was probably left over from that. His mom was still concerned and scheduled an appointment with his internist.

The next week the patient met with his internist. He reported that 3 to 4 weeks earlier he had had the 'flu'. He had run a fever. He had experienced muscle and joint pain and had felt very weak. He still was feeling pretty fatigued, but most of the other symptoms had abated. After that the rash had appeared. It didn't seem to be spreading and didn't itch or hurt, so he didn't know why he was here..... The doctor performed his exam. The patient's heart rate, lungs and blood pressure were all normal. The patient's temperature was normal. Axial and cervical lymph nodes were enlarged. The doctor ordered blood drawn and several tests to be done.

Later that week the doctor's office called and asked the patient to come in for a consultation and to bring someone, possibly his mother with him. In the office, the doctor told the patient that unfortunately he had contracted the HIV virus. He was in the very early stages of infection and while there is no cure, there are some very effective treatments. He recommended the patient immediately begin antiretroviral therapy (ART) and possibly consult a specialist (immunologist) in the field.

Current recommendations for ART are that patients take 3 HIV medicines from at least two classes of drugs. One class inhibits the action of a viral enzyme called nucleoside reverse transcriptase. This enzyme is critical to the replication of viral genetic information. So the drugs are called nucleoside reverse transcriptase inhibitors. The drug binds to the active site or to a site on the enzyme that changes the shape of the active site. Protease inhibitors are another class of drugs that are important HIV medicines. Protease inhibitors block an HIV protease needed in viral replication. If the enzyme is blocked virus propagation is affected. Integrase inhibitors, a third class of medicines that inhibit the HIV enzyme integrase which is necessary for its own nucleic acid replication. These drugs, by blocking the virus's enzymes, stop the virus from replicating and accelerating the disease process. By understanding protein structure and how proteins work, scientists have created treatments for one of the world's major killers! That is why biochemistry is so cool and important!