

Protein Structure:Vampires & Vaccine

by paceSCIENCE


PROVIDENCE ALLIANCE OF CLINICAL EDUCATORS PRESENTS:

PROTEIN STRUCTURE: VAMPIRES AND VACCINES

FATHER AND SON, THADDEUS AND ABRAHAM, WERE TIRED AFTER A LONG DAY OF WORKING IN THE DAIRY



IT WAS A FOGGY NIGHT...



THADDEUS AND ABRAHAM MADE THEIR WAY TO THE OLD MILL TAVERN FOR SOME WELL-DESERVED CIDER

THE FOG WAS THICK AND THERE WAS AN EERIE SENSE OF DREAD IN THE AIR



THEY FELT A PRESENCE WATCHING THEM AS THEY WALKED...

THEY WERE RELIEVED TO FIND THAT THE WHOLE TOWN WAS IN THE TAVERN



...BUT THEY WERE NOT THERE A MINUTE WHEN A STRANGE MAN KNOCKED AT THE DOOR...

ALL CONVERSATION IN THE TAVERN STOPPED...



...THERE STOOD A TALL, PAINFULLY THIN MAN, WITH SKIN AS PALE AS THE WINTER FROST, VISIBLE FANGS, POINTED EARS, AND BLACK EYES.

THE IMPATIENT BARTENDER WAS NOT CONCERNED BY THE STRANGE LOOK OF THE VISITOR.



WHAT ARE YOU WAITING FOR, DON'T LET IN THE COLD! COME IN AND JOIN US FOR A DRINK!

THE NEXT SCENE SEEMED TO HAPPEN IN SLOW MOTION...



THE PALE MAN LUNGED UPON HIS FIRST VICTIM, BITING HIM AND LEAVING HIM PALE AND LIFELESS.

THE PALE CREATURE FEASTED UNTIL EACH AND EVERY PERSON IN THE BAR WAS REDUCED TO A DRAINED, LIFELESS CORPSE.



...BUT LUCKILY, THADDEUS AND ABRAHAM HAD BEEN ABLE TO HIDE FROM THE WRATH.

THADDEUS SHOT THE PALE BEAST... BUT RATHER THAN SLOWING, THE MONSTER LUNGED AT HIS NECK.

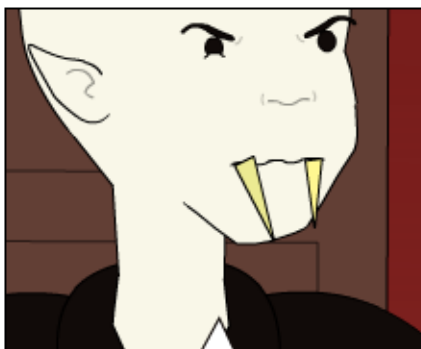


IN HORROR, ABRAHAM GRABBED A BROKEN TABLE LEG AND THRUST IT AT THE MONSTER'S BACK...

...AND HE DID NOT STOP PUSHING IT UNTIL IT WAS THROUGH THE CREATURE'S HEART



AS THE DEAD VAMPIRE SLUMPED TO THE FLOOR, ABRAHAM REALIZED THAT HE WAS THE LONE SURVIVOR.



THE CREATURE'S PALE SKIN, CLAWS, POINTED EARS, BLACK EYES, AND FANGS WERE FOREVER BURNED INTO ABRAHAM'S MEMORY.

ABRAHAM PLEDGED TO BRING THE VAMPIRE'S CORPSE TO EVERY TOWN.. TO SHOW PEOPLE WHAT TO LOOK FOR...



...UNTIL EVERY TOWN KNEW HOW TO RECOGNIZE THE FEATURES OF A VAMPIRE...SO THAT NO MORE INNOCENTS WOULD DIE...

VAMPIRES ACROSS COLONIAL AMERICA WERE RECOGNIZED AND SHOWN A WOODEN STAKE.



SOON THERE WERE NO MORE VAMPIRES. A CENTURY LATER, PEOPLE DOUBTED THAT THAT VAMPIRES EVER EXISTED.

SCIENTIFIC EXPLANATION



SEEING A VAMPIRE, YOU RECOGNIZE PALE SKIN, POINTY EARS, LONG CLAWS, ALL BLACK EYES, AND FANGS AS THE PHYSICAL PARTS OF A VAMPIRE.



FEATURES ARE WHAT YOU USE TO DISTINGUISH A VAMPIRE FROM OTHER HUMANS AND CAN BE CONSIDERED VAMPIRE "EPITOPES."

EPITOPES ARE SPECIAL FEATURES OF A STRUCTURE (LIKE THE FANGS ON A VAMPIRE) THAT THE IMMUNE SYSTEM USES TO RECOGNIZE FOREIGN CELLS

FOREIGN CELLS ARE CELLS THAT THE IMMUNE SYSTEM THINKS MAY BE THREATS ... BECAUSE THESE CELLS DO NOT LOOK LIKE REGULAR IMMUNE SYSTEM CELLS...

BECAUSE THEY HAVE CERTAIN EPITOPES



IF THE IMMUNE SYSTEM THINKS THAT AN EPITOPE DOESN'T LOOK RIGHT, THEN THE FOREIGN CELL WILL BE DESTROYED.

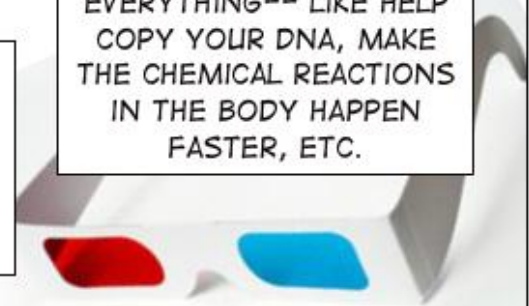
THE IMMUNE SYSTEM HAS A "SHOOT FIRST, ASK QUESTIONS LATER-- THEN SHOOT AGAIN TO MAKE SURE IT IS DEAD" PHILOSOPHY.



MOST EPITOPES ARE **PROTEINS**.

NUCLEOTIDE SEQUENCES IN YOUR GENES CODE FOR YOUR AMINO ACID SEQUENCES. A **PROTEIN** IS DEFINED AS JUST ONE OR MORE AMINO ACID CHAINS.

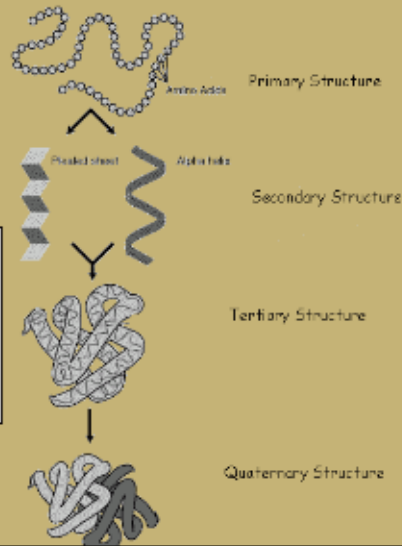
PROTEINS DO EVERYTHING-- LIKE HELP COPY YOUR DNA, MAKE THE CHEMICAL REACTIONS IN THE BODY HAPPEN FASTER, ETC.



YOUR GENES TELL THE AMINO ACID CHAIN HOW TO FOLD. IT'S THE SPECIFIC 3-D STRUCTURE OF A PROTEIN THAT MAKES ONE PROTEIN DIFFERENT THEN THE NEXT, AND ALLOWS THESE PROTEINS TO DO SPECIFIC FUNCTIONS.

PALE SKIN AND BLACK EYES CLUE US TO RECOGNIZE A VAMPIRE.

STRUCTURE AND FOLD OF PROTEINS CLUE OUR IMMUNE SYSTEM TO RECOGNIZE ABNORMAL PROTEINS.



ALPHA HELICES AND BETA SHEETS--- (THESE ARE ALSO KNOWN AS "SECONDARY STRUCTURES") ARE TYPES PHYSICAL PROTEIN STRUCTURE. "TERTIARY STRUCTURE" IS WHAT YOU CALL THE STRUCTURE IF IT IS FOLDED.

THE **EPITOPE** IS THE PART OF THE ANTIGEN THAT TELLS THE IMMUNE SYSTEM THAT THE WEIRD CELL DOES NOT LOOK LIKE OTHER CELLS.

SECONDARY+ TERTIARY STRUCTURES MAKE UP THE EPITOPES IN MOST ANTIGENS. AN **ANTIGEN** IS THE SUBSTANCE THAT CAUSES THE IMMUNE SYSTEM TO MAKE ANTIBODIES.

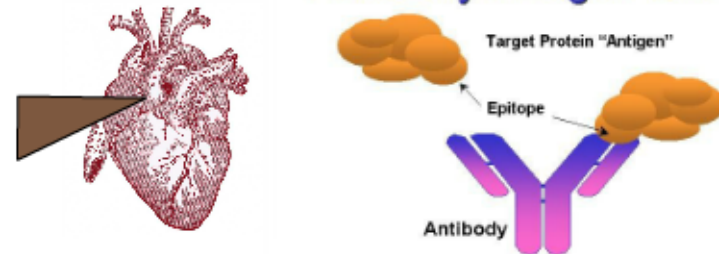


THE EPITOPE IS LIKE THE PALE SKIN, FANGS, AND OTHER VAMPIRE FEATURES.



THE ANTIGEN IS LIKE THE WHOLE VAMPIRE.

Antibody-Antigen Binding



THE ANTIBODY IS THE WOODEN STAKE THAT THE IMMUNE SYSTEM USES TO DESTROY THE ANTIGEN.

THE SEQUENCE OF AMINO ACIDS THAT A PROTEIN IS MADE OF (PRIMARY STRUCTURE) DOES USUALLY NOT CONTRIBUTE TO EPITOPES IN LIVING SYSTEMS BECAUSE MOST FUNCTIONAL PROTEINS ARE FOLDED.



EPITOPES THAT COME FROM FOLDED STRUCTURES ARE CALLED CONFORMATIONAL EPITOPES.

QUATERNARY STRUCTURE IS JUST COMBINATION OF TWO OR MORE CHAINS, TO FORM A COMPLETE UNIT

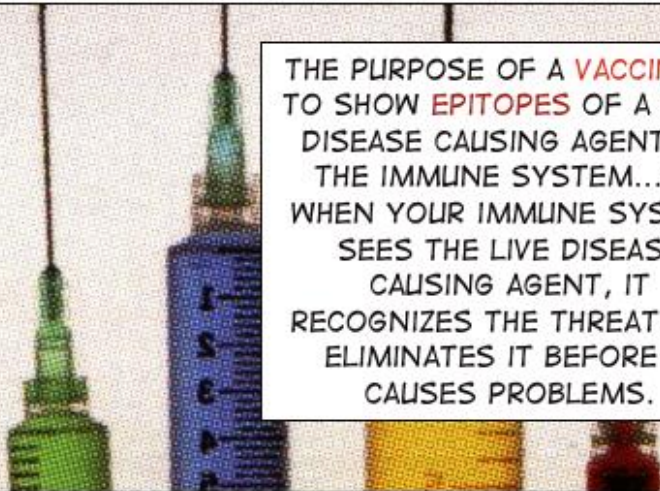


WHEN ABRAHAM CARTED THE VAMPIRE'S CORPSE FROM TOWN TO TOWN, HE HELPED VILLAGERS RECOGNIZE THE FEATURES OF A VAMPIRE SO THAT VAMPIRES COULD BE NEUTRALIZED BEFORE THEY HARMED TOWNSPEOPLE.

ABRAHAM WAS PROVIDING A "VAMPIRE VACCINE" THAT IMMUNIZED THE TOWN FROM FUTURE VAMPIRE ATTACKS.

THE PURPOSE OF A VACCINE IS TO SHOW EPITOPES OF A DEAD DISEASE CAUSING AGENT TO THE IMMUNE SYSTEM...SO WHEN YOUR IMMUNE SYSTEM SEES THE LIVE DISEASE CAUSING AGENT, IT RECOGNIZES THE THREAT AND ELIMINATES IT BEFORE IT CAUSES PROBLEMS.

...YOU CAN DEVELOP IMMUNITY THROUGH BEING PREVIOUSLY INFECTED BY SOMETHING (OUCH).
...VACCINES ARE LESS PAINFUL THAN THE ACTUAL DISEASE THEY PROTECT AGAINST.



ABRAHAM WILL NEVER FORGET THE FACE OF ANOTHER VAMPIRE AGAIN..BUT HE HAD TO SEE HIS WHOLE TOWN SLAUGHTERED IN FRONT OF HIM IN ORDER TO GIVE HIM THAT MEMORY...



...IF A FEW MINUTES AFTER ABRAHAM'S WHOLE TOWN HAD BEEN MASSACRED, A STRANGER HAD WALKED INTO THE BAR AND WARNED ABRAHAM WHAT VAMPIRES LOOKED LIKE...IT WOULD NOT HAVE DONE THE TOWN ANY GOOD.



IN OTHER WORDS, A VACCINE THAT IS DELIVERED WHILE YOU ARE ACTIVELY SICK WITH THE DISEASE YOU ARE TRYING TO PREVENT IS TYPICALLY USELESS.

VACCINES DELIVER EPITOPES OF THE "DISEASE CAUSING AGENTS" TO THE IMMUNE SYSTEM ...ALLOWING THE BODY TO RECOGNIZE AND DESTROY THE DISEASE BEFORE THE DISEASE CAUSES SERIOUS TROUBLE.

