



Growing Fingernails

To compare the rates of growth of the thumbnails on your two hands cut them at the same time each week. Clip the nails square across the center and save the two pieces of nail in labelled envelopes.

After several weeks line up the pieces of right thumbnail on a card so that they are just touching in the direction in which they grew. Tape the nail pieces to the card for a permanent display. Do the same for the left thumbnails and then you can compare the rates of growth by measuring the rows of clippings.

Ordinarily fingernails grow about 3.8 centimetres per year but toenails grow only about one half as fast. Thumbnails seem to grow faster than the nails on other fingers because thumbs are more active than fingers. Perhaps this gives thumbs a faster blood flow and accounts for the differences between the nails of left- and right hands.

Fingernails are made of the protein alpha-keratin which has long molecules made up of chains of thousands of atoms. Each link in the molecular chain is a pair of carbon atoms and a nitrogen atom joins the links together. The bonds between these atoms are pairs of electrons, so a piece of protein molecular chain looks like this :N:C:C:N:C:C: etc., where the dots represent electrons. Other atoms, called sidechains, are bonded to the atoms of the main chain like charms on a bracelet.

Keratin molecules are twisted together in threes like strands of a rope. The strands are held together by bridges made from sulfur (S) atom side-chains. The S atoms on one protein strand are bonded to the S atoms on the neighbour strand by a pair of electrons and this 3D network toughens the fingernail. When keratin is heated or shocked the S:S bonds break leaving a single, "unpaired" electron on each sulphur atom. These "unpaired" electrons are tiny magnets and can be measured in an electron spin resonance (ESR) spectrometer.

Your fingernail clippings give ESR signals because the scissors have broken some S:S bonds. Chemists working with archaeologists have used ESR to prove that the proteins in charred bones in a cave near Beijing were cooked on a fire 230,000 years ago.

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