

When the RNA copy is complete, it snakes out into the outer part of the cell. Then, in a dazzling display of choreography all the components of a molecular machine lock together around the RNA to form a miniature factory called a ribosome. It translates the genetic information in the RNA into a string of amino acids that will become a protein. Special transfer molecules, the green triangles, bring each amino acid to the ribosome. The amino acids are the small red tips attached to the transfer molecules. There are different transfer molecules for each of the 20 amino acids. Each transfer molecule carries a three letter code that is matched with the RNA in the machine. Now we come to the heart of the process. Inside the ribosome the RNA is pulled through like a tape. The code for each amino acid is read off three letters at a time and matched to three corresponding letters on the transfer molecules. When the right transfer molecule plugs in, the amino acid it carries is added to the growing protein chain. Again, you are watching this in real time. And after a few seconds the assembled protein starts to emerge from the ribosome. Ribosomes can make any kind of protein. It just depends what genetic message you feed in on the RNA. In this case, the end product is hemoglobin. The cells in our bone marrow churn out a hundred trillion molecules of it per second. And as a result our muscles, brain and all the vital organs in our body receive the oxygen they need.