0:00:00.000,0:00:06.080

Two the categories you been learning

about the macromolecules that make up

0:00:06.080,0:00:12.219

all cells are nucleic acids and proteins

and I want to talk about the connection

0:00:12.219,0:00:22.779

between these categories. Nucleic acids

include DNA and RNA now the DNA is the

0:00:22.779,0:00:26.150

stuff your chromosomes are largely made

out of.

0:00:26.150,0:00:30.679

And along the length of those

chromosomes there are entities called

0:00:30.679,0:00:39.219

genes and what most genes do is in code

the information to make a protein. It's

0:00:39.219,0:00:45.800

spells out to the cell's machinery how to

construct one of the thousands of

0:00:45.800,0:00:51.629

different enzymes you need to have your

cells function and to have the whole

0:00:51.629,0:01:02.449

organism function well. So genes specify

the construction of a protein. In putting

0:01:02.449,0:01:03.840

that together

0:01:03.840,0:01:09.970

proteins accomplish the most intricate

tasks inside your cells. When you who

0:01:09.970,0:01:16.650

need something that really is specific

It's done by proteins for example you

0:01:16.650,0:01:22.950

get a vaccine or you make antibodies

after you've been exposed to some, some

0:01:22.950,0:01:29.810

bug. Those antibodies those exquisitely

sensitive molecules are made of protein.

0:01:29.810,0:01:38.159

as are many of your hormones like growth

hormone and insulin. The intricate

0:01:38.159,0:01:43.020

machinery that pumps molecules into and

out of cells to keep them at their

0:01:43.020,0:01:51.430

optimum. And then there's the category of

Enzymes. Enzymes are nearly always

0:01:51.430,0:02:00.930

proteins and they’re proteins that do one

specific job and they do it very well.

0:02:00.930,0:02:06.390

A gene encodes the information to make

an enzyme the sequence of amino acids

0:02:06.390,0:02:12.459

that folds into particular shapes and

that shape allows it to bind what's

0:02:12.459,0:02:13.360

called its

0:02:13.360,0:02:19.270

substrate and that substrate is

subsequently changed into the products

0:02:19.270,0:02:25.960

of that reaction. For example most of us

but not all of us make an enzyme called

0:02:25.960,0:02:33.090

lactase through our lives and this

allows us to digest milk sugar lactose

0:02:33.090,0:02:39.580

and divide them into sugars that we can

absorb and used for energy. But some of

0:02:39.580,0:02:45.680

us lack this enzyme especially later in

life and it means that we can't digest

0:02:45.680,0:02:52.760

milk sugars and that sugar goes on in

our gut to become fuel for our bacterial

0:02:52.760,0:03:02.760

population. And we have that lactose

intolerance. So genes make proteins and

0:03:02.760,0:03:10.920

enzymes are a category of protein and

they work to speed up reactions they can

0:03:10.920,0:03:17.400

work amazingly quickly. An enzyme we use

in lab here is called catalase in it can

0:03:17.400,0:03:24.280

break down its substrate is hydrogen

peroxide, get this, 10,000 molecules of

0:03:24.280,0:03:27.670

hydrogen peroxide per second.

0:03:27.670,0:03:34.799

Unbelievably quickly. Remember your cells

are incredibly complex and highly

0:03:34.799,0:03:40.580

ordered and they need things to happen

very fast to maintain that orderliness.

0:03:40.580,0:03:47.880

And enzymes are the mechanism by which

that high level of complexity can be

0:03:47.880,0:03:55.190

maintained. Not all are enzymes worked

perfectly and one of the reasons that

0:03:55.190,0:03:58.040

they can fail is because of mutation.