

Some differences between prokaryotic cells (bacteria) and eukaryotic cells (plant, animal, fungi)

Structural Differences

Prokaryotic (P)	Eukaryotic (E)	Comment
Small cells 1-2 micrometers	Large cells 10-1,000 microm.	Ch.6
Large surface area/volume ratio	Smaller surface area/vol. ratio	Ch. 6
Rapid metabolic rate	Slower metabolic rate	Ch. 8
Cells divide in 15 minutes	Cells take hours to days to divide	Ch. 12
No internal membrane structures	Lots of internal membrane str.	Ch. 6, 17 & 18
One circular chromosome	Many linear chromosomes	Ch. 12
Peptidoglycan cell wall	Cellulose cell wall in plants	Ch. 6
Ribosomes different than those	found in eukaryotic cells	
Operons present	Operons absent	Ch. 18
Transcription different in P vs. E		Ch. 17

Discussion:

Since prokaryotic cells lack a nuclear membrane they cannot separate transcription from translation (Ch. 17). This results in prokaryotic cells being unable to evolve complicated genes with introns and exons. This limits prokaryotic cells to a unicellular form, where as eukaryotic cells enjoy the more complicated multicellular forms. Also, prokaryotic cells are thus relegated to being simple *decomposers* in the ecosystem, though some do contain chlorophyll and can photosynthesize.

Many antibiotics inhibit the ribosomes of bacteria, but our eukaryotic ribosomes, being different, are not affected. Lucky us.

The circular chromosome means prokaryotic cells never grow old and die. They can keep dividing forever, as long as there is adequate food, etc. Eukaryotic cells can divide about 50 times. After that they grow old and die.

Operons allow bacteria to turn on many genes with one Operator. Evolution has made it easy for bacteria to turn on their genes since they are unicellular and are likely to use all the genes they have. A unicellular creature must perform all the functions of life for itself. It is not multicellular, like many eukaryotic cells, which have different cells specialized for different functions: heart for pumping, brain for thinking, stomach for digesting, mouth for eating, bones for structure, muscles for contracting, ovaries and testes for reproducing, etc. Example: brain cells think; they then must keep the genes for all the other functions of life turned off. You do not want your brain cells to suddenly turn on genes for laying down bone...do you?