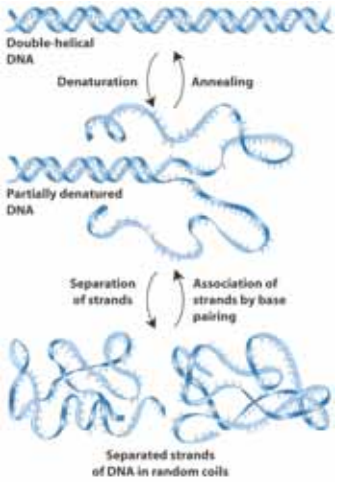
Chem 431A-L08-F'07
8 Oct; Monday
admin: Reminder about calculator found in back of class.

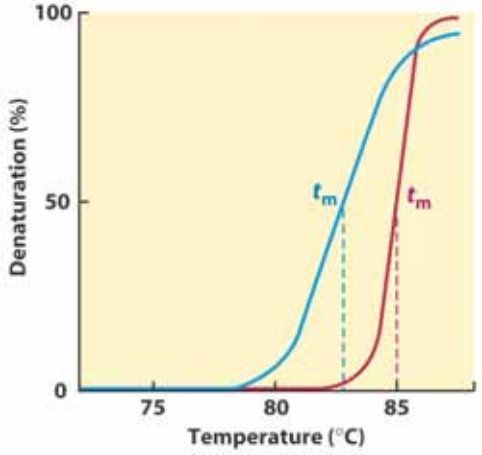
Online quiz for chapt 1 & 2 Deadline is Wednesday 10/10/2007
11:59 pm PDT
(so far only 21 ch1 and 12 in ch2)
Today:
(1)Review denaturation of DNA (2) RNA structure
(3)Mutation, changes to DNA (4) DNA sequencing by Sanger method

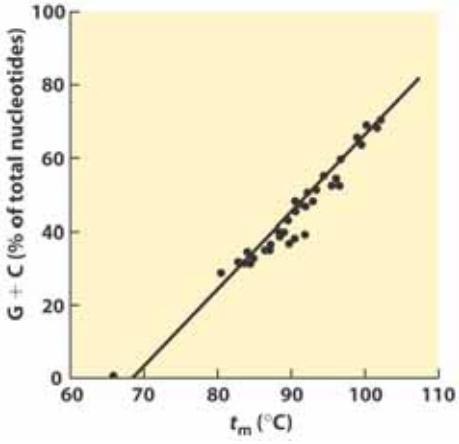
Last time, we discussed 2° and 3° structure (and palindromes) of DNA
Melting(denaturation) of DNA -
Review melting: physical change
Physical aspects: T, acids?, dielectric constant



What happens to double stranded (duplex) DNA in vitro when it is subjected to disruptive environmental factors like high temperatures:
native DNA (double helix)—> random coil
(why? There are forces that tend to separate the DNA)

Cooling must be slow. to allow the strands to "anneal" and form the duplex. The melting temperature is defined below. It is affected by the %GC content due to the greater H-bonding of GC vs AT base pairs.





Be clear on the thermodynamics of this: What is the meaning of each point in the curve? Each point is an equil point.	What is G at equil? What is G when we are at T_m? What happens to T_m when we change the solvent's polarity? Solvent's pH. The DNA's A=T composition?

RNA structure:

Function is to deliver genetic information from DNA to the cytosol to be used for synthesis proteins (polypeptide chains)

During protein synthesis, RNA conc increases in the cell

Jacob and Monod (1961): MRNA (messenger RNA) carries info from DNA to ribosomes where it acts as template that specify amino acid sequences in polypeptide chains.

First RNA is "transcribed"; transcription always forms single-strand RNA. (unlike replication of DNA where 2 strands are formed).

1 mRNA may code for 1 or more polypeptide chains. If only one, monocistronic if more than one, polycistronic.

One DNA (gene) can transcribe into many mRNA's concurrently. One mRNA can be translated by many ribosomes at the same time speeds up polypeptide synthesis.

DNA is very stable but RNA has a short halflife. It does not persist when the need for polypeptide synthesis is over.

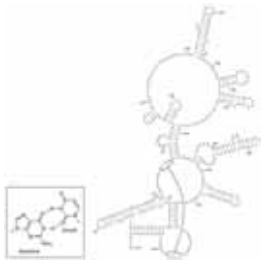
In eukaryotes. mRNA mostly monocistronic.

If have a polypeptide of N aa's, need at least a mRNA of length 3N because each aa has a 3 base code (triplet). Additional nucleotides are needed for regulation of the protein synthesis.

Transfer RNA. tRNA =adapter molecules in protein synthesis, covalently linked to an amino acid in one end and complementary to mRNA on the other.

Base pairing in RNA
also occurs: between RNA and RNA and also between RNA and DNA.
Pairing is the same: A=T becomes A=U and G=C is still G=C

tRNA is smaller than mRNA. In general RNA has no definitive 2° struc like DNA does. Usually many hair pin loops. Base stacking plays major role. When double helix forms, mostly A-form (right handed). The 3° struc is complex like proteins.



Chemistry of DNA:

1) mutations = permanent changes in genetic info due to changes in DNA structure.
Can be induced by environment or arise spontaneously. Factors that can cause mutation: radiation (UV), reactive chemicals like alkylating and deamminating agents. Also: oxygen radicals (greatest amount of damage thousands a day per cell DNA) Fortunately: repair mechanisms present.
Implicated in cancer and aging.

2) Example of spont. chemical changes: deamination
most rapid: cytosine → uracil (100/day)

(fortunately, DNA doesn't have Uracil and the cell has repair mechanisms that correct the problem)
3) another example in DNA: hydrolysis of pentose and the base (purines more than pyrimidines)

DNA can be sequenced:

Sanger method: uses dideoxynucleotides ddNTP. ddNTP has 3' –H not 3'-OH.
Stops process of elongation of polynucleotide chain.

(see problem 11 in problems at end of the book, see if you get the same answer as in the back)