Hi Yulia,

Again, sorry for my delay in responding.  It took me a while to find one example of what I hope will be a good answer to your question.  I must say that I probably emphasized too much the Watson-Crick type of H-bonding, while ignoring telling you about other kinds of H-bonding that are possible for the same type of nucleotides.  Here is my attempt to answer your question:

Q = To your knowledge, can two nucleic acids (two products from two labs) have the same exact chemical structure but different hybridization pattern?

A = Yes.  A DNA polymerase Hpol iota can insert 2’-deoxyguanine triphosphate (dGTP) opposite to 2’-deoxythymine (dT). Obviously, the G-T pairing is not Watson-Crick but rather a Hoogsteen base pairing.  Therefore, you have that the normal G-C base pairing seen with conventional DNA was changed by the Hpol iota to a Hoogsteen base pairing.  I have highlighted this section in the enclosed paper for you to read.  It turns out that the conformation of the nucleoside (North or South and syn or anti) can alter the way the H-bonding occurs.  Mark can tell you more about the definitions of North/South and syn/anti if you need more information.

When you read the paper, you can see that we were able to overcome the tendency to form a Hoogsteen base pair by using a conformationally rigid dATP analogue (North-MC-dATP) which was efficiently incorporated opposite to dT; thus, recovering the normal A-T Watson-Crick base pairing.

Since memory is not a problem with modern computers, all these structures can be illustrated accurately in each case showing the specific H-bonding pattern for each nucleic acid/nucleic acid or nucleic acid/protein complex.

The hybridization pattern is not determined by the manufacturing process and although there is a preferred default H-bonding pattern, other alternatives are also possible.

Hope this helps…

Victor

**From:** "Borodina, Yulia" <[Yulia.Borodina@fda.hhs.gov](mailto:Yulia.Borodina@fda.hhs.gov)>  
**Date:** Tuesday, August 14, 2018 at 1:14 PM  
**To:** "Marquez, Victor (NIH/NCI) [V]" <[victor.marquez@nih.gov](mailto:victor.marquez@nih.gov)>  
**Subject:** RE: questions to Victor

Hi Victor,

No, your responses are still very useful!  I know I’m annoying but let me ask you one last question. To your knowledge, can two nucleic acids (two products from two labs) have the same exact chemical structure but different hybridization pattern?

I do not understand why hydrogen bonding is always indicated explicitly for nucleic acids but not for proteins where it also happens… Trying to find an explanation in the literature and cannot. If the particular hybridization is determined by the manufacturing process then, sure, it should be indicated explicitly. If however, it happens spontaneously and cannot be adjusted, I don’t see why it has to be indicated.

Thank you so much for all your help!

Yulia