Structural Perturbations Induced by the α-Anomer of the Aflatoxin B_1 Formamidopyrimidine Adduct in Duplex and Single-Strand DNA

Supporting Information

Kyle L. Brown, Markus W. Voehler, Shane M. Magee, Constance M. Harris, Thomas M. Harris, and Michael P. Stone*

Department of Chemistry and Center in Molecular Toxicology, Vanderbilt University, Nashville, Tennessee 37235

*Author to whom correspondence should be addressed.

Michael P. Stone

Telephone 615-322-2589

FAX 615-322-7591

email: michael.p.stone@vanderbilt.edu

Table S1. Resonance Assignments for AFB-α-FAPY Modified 5'-d($C^1T^2X^3A^4$)-3'.

Nucleotide	*Atom*	*Chemical Shift (ppm)*	*Nucleotide*	*Atom*	*Chemical Shift (ppm)*
C^1	H1'	5.81	A^4	H1'	6.27
C^1	H2'	2.02	A^4	H2'	2.69
C^1	H2''	2.40	A^4	H2''	2.51
C^1	H3'	4.53	A^4	H3'	4.62
C^1	H4'	3.92	A^4	H4'	4.17
C^1	H5	5.54	A^4	H5'	4.00
C^1	H5'	3.58	A^4	H5''	3.96
C^1	H6	7.48	A^4	H8	8.29
T^2	H1'	6.19	AFB^5	H5	5.72
T^2	H2'	2.21	AFB^5	H5B	5.71
T^2	H2''	2.37	AFB^5	H6a	6.13
T^2	H3'	4.71	AFB^5	H8	5.66
T^2	H4'	4.28	AFB^5	H9	6.16
T^2	H5'	3.92	AFB^5	H9a	3.66
T^2	H5''	3.89	AFB^5	OCH^3	3.76
T^2	H6	7.54			
T^2	M7	1.70			
X^3	H1'	5.62			
X^3	H2'	2.30			

X^3	H2''	1.88	
X^3	H3'	4.54	
X^3	H4'	4.11	
X^3	H5'	3.82	
X^3	H5''	3.74	
X^3	H8	8.27	

Figure S1. Electronic circular dichroism of the AFB-α-FAPY and AFB-β-FAPY anomers in oligodeoxynucleotides. The duplex 5'-d(CTATXATTCA)-3'•5'-d(TGAATCATAG)-3' (panel A) was compared to 5'-d(CTATXATTCA)-3' (panel B). Unmodified oligodeoxynucleotides (solid black line) were compared to oligodeoxynucleotides containing the AFB-β-FAPY (broken black line) and AFB-α-FAPY (solid red line) adducts.

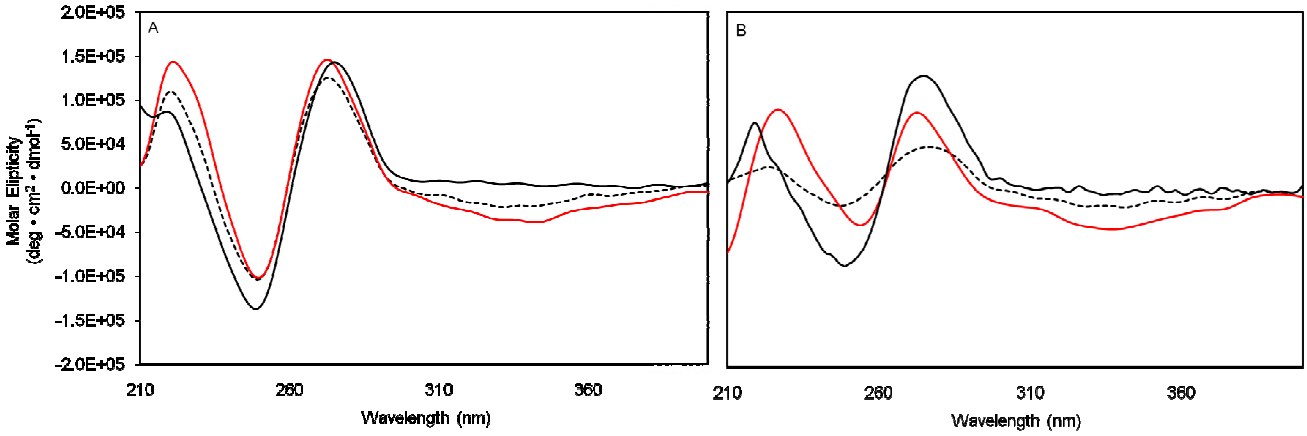

Figure S2. UV spectra of AFB-FAPY modified 5'-d(CTATXATTCA)-3'. The spectra of the α anomer (—) is compared to that of the β anomer (—) in **panel A**. The absorbance units on the Y-axis are normalized to the maximum absorbance of 1.0. The spectrum of the α anomer (—) is compared to that of the chromatographically inseparable shoulder preceding the main α anomer peak (—) in **panel B**.

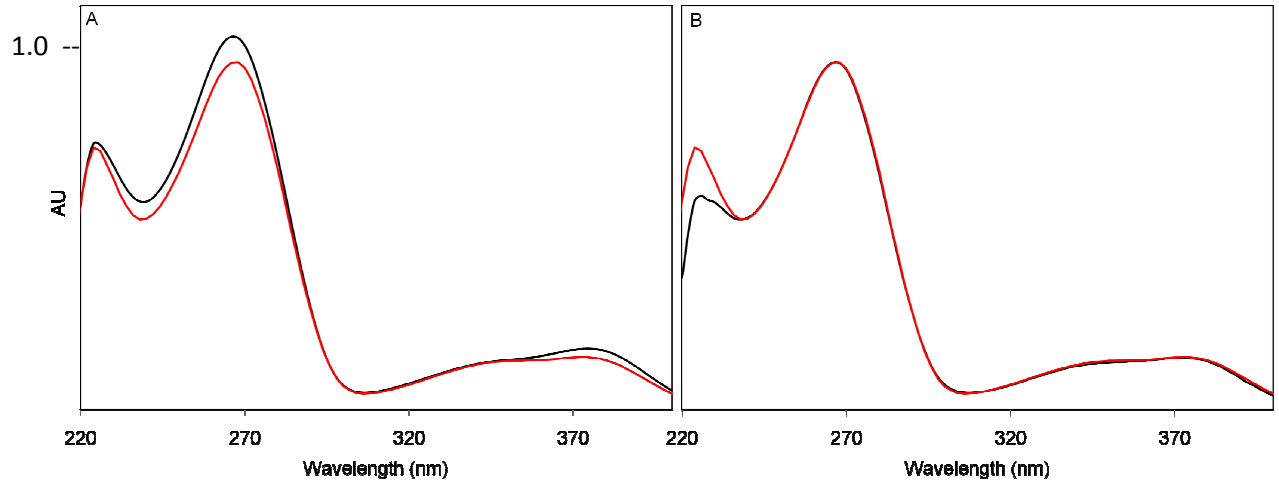

Figure S3. NOESY assignments of purine H8 and pyrimidine H6 protons to deoxyribose H1' protons for the AFB-α-FAPY modified duplex 5'-d(CTATXATTCA)-3'•5'-d(TGAATCATAG)-3'. **Panel A:** The connectivity for the modified strand was broken between T^4 H1' and A^6 H8. **Panel B:** The connectivity for the complementary strand was broken between C^{16} H6 and A^{17} H1'. The intra-nucleotide purine H8 and pyrimidine H6 to deoxyribose H1' cross peaks are labeled.

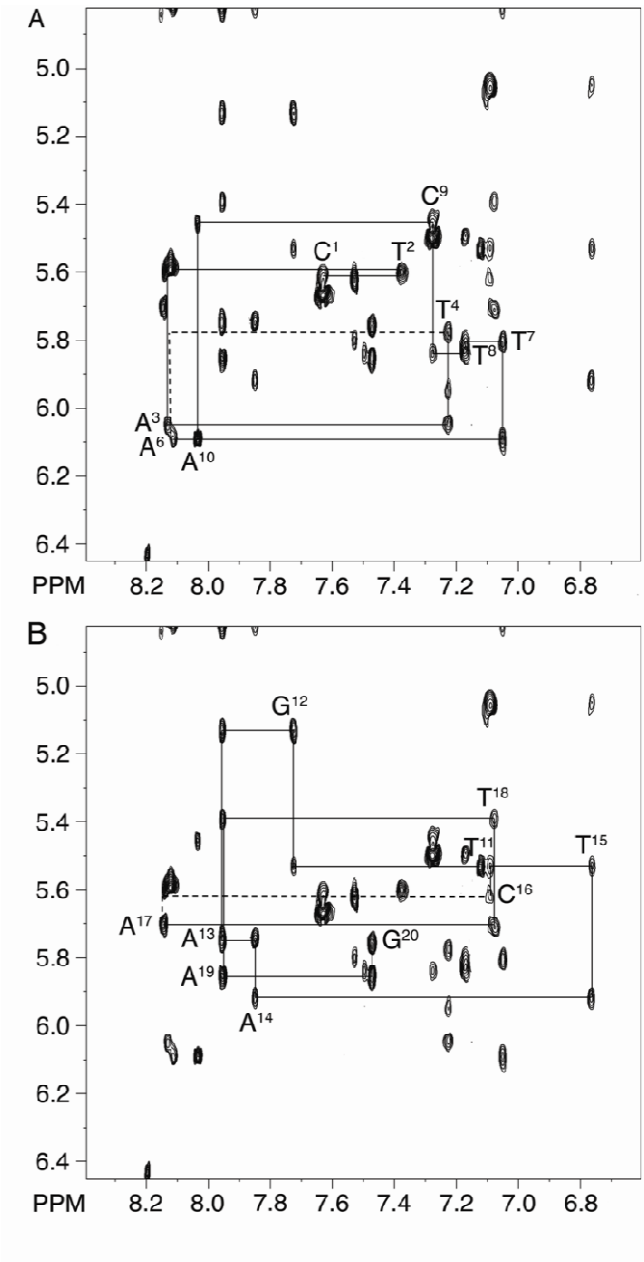

Figure S4. Upper Panel. NOE connectivity for the Watson-Crick base paired amino protons of the AFB-α-FAPY modified duplex. The cross peaks are: a, AFB OCH_3→X^5 H3; b, C^{16} H41→X^5 H3; c, X^5 H21→X^5 H3; d, X^5 H22→X^5 H3; e, A^6 H61→X^5 H3; f, C^{16} H42→X^5 H3; g, C^9 H42→G^{12} H1; h, C^1 H42→G^{20} H1; i, A^{13} H61→G^{12} H1; j, C^9 H41→G^{12} H1; k, C^9 H5→G^{12} H1; l, AFB OCH_3→T^4 H3; m, A^3 H61→T^{18} H3; n, A^{17} H62→T^4 H3; o, A^{17} H61→T^4 H3; p, A^3 H2→T^{18} H3; q, A^{17} H2→T^4 H3; r, A^6 H2→T^{15} H3; s, A^{14} H61→T^{15} H3; t, A^6 H62→T^{15} H3; u, A^{14} H62→T^7 H3; v, A^{14} H61→T^7 H3; w. A^{14} H2→T^7 H3; x; A^{13} H2→T^8 H3; y, A^{13} H61→T^8 H3; z, A^{13} H62→T^8 H3. **Lower Panel.** NOE connectivity for the Watson-Crick hydrogen bonded imino protons of the AFB-α-FAPY modified duplex. The data was collected at 500 MHz. using a mixing time of 250 ms. The temperature was 5 °C.

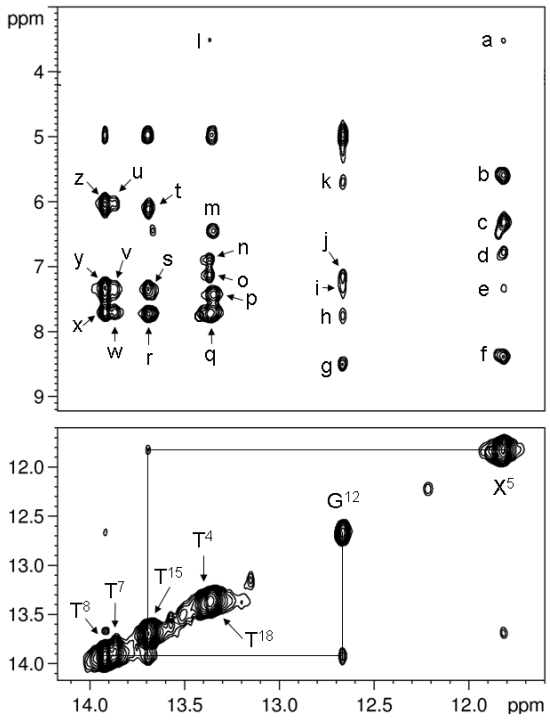

Figure S5. ^{31}P NMR of AFB-α-FAPY in 5'-d($C^1T^2A^3T^4\underline{X}^5A^6T^7T^8C^9A^{10}$)-3'•5'-d($T^{11}G^{12}A^{13}A^{14}T^{15}C^{16}A^{17}T^{18}A^{19}G^{20}$)-3' (upper panel) and in 5'-d($C^1T^2X^3A^4$)-3' (lower panel). The phosphate resonance of C^{16} was observed at 0.9 ppm (upper panel).

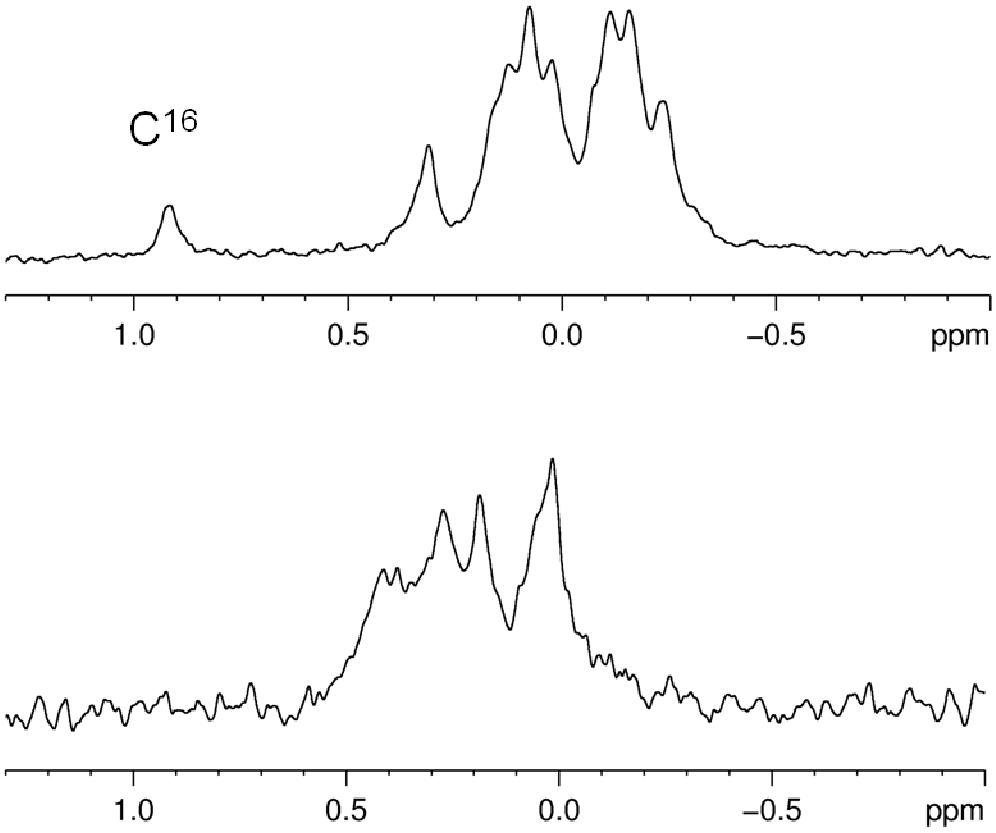

Figure S6. ^{1}H NMR of AFB-α-FAPY modified tetramer aromatic protons. A single formyl proton resonance assigned as the *E* isomer was observed at 5 °C (lower panel). A formyl resonance assigned as the *Z* isomer was apparent at 30 °C (upper panel).

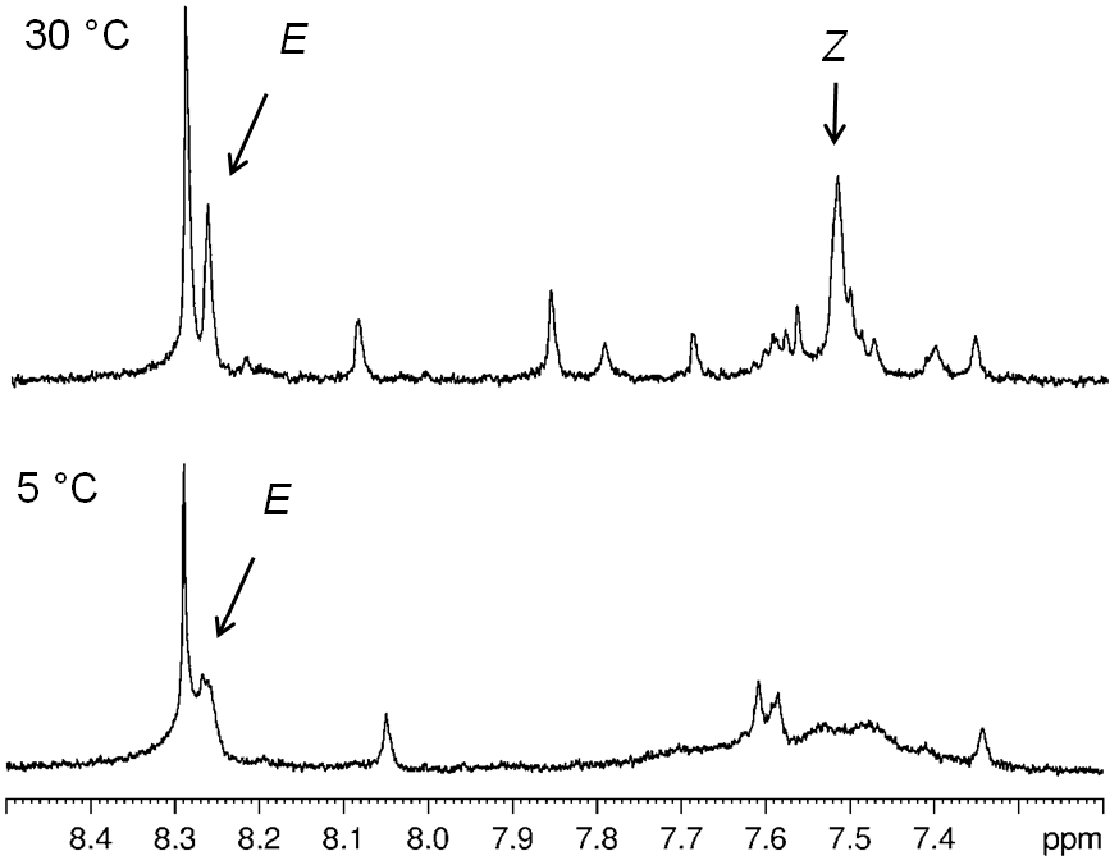

Figure S7. NOE assignments of AFB inter-nucleotide and deoxyribose intra-nucleotide cross-peaks for the AFB-α-FAPY modified 5'-d($C^1T^2\underline{X}^3A^4$)-3'. The cross peaks are assigned as (a) A^4 H4'→A^4 H1' (b) AFB OCH_3→T^2 H1' (c) AFB H9a→ AFB H9 (d) AFB H9a→ AFB H6a (e) A^4 H2'→ A^4 H1' (f) A^4 H2"→ A^4 H1' (g) T^2 H2"→T^2 H1' (h) T^2 H2'→T^2 H1' (i) C^1 H2'→C^1 H1' (j) C^1 H2"→C^1 H1' (k) AFB OCH_3→ AFB H5 (l) X^3 H5"→ X^3 H1' (m) X^3 H2'→ AFB H5 (n) X^3 H2"→ AFB H5 (o) X^3 H2"→ X^3 H1' (p) X^3 H2'→ X^3 H1'.