	I RecJ-SSBP experiments, trityl-on
S1	TTTGTGTCCAAGAATGTTTCCATCTTCTTTAAAATCAATA
S2	CCATGATGTATACATTGTGTGAGTTATAGTTGTATTCCAA
S3	CACCCTCTCCACTGACAGAAAATTTGTGCCCATTAACATC
S4	ATTTTGAAGTTAACTTTGATTCCATTCTTTTGTTTGTCTG
S5	GTCTGCTAGTTGAACGCTTCCATCTTCAATGTTGTGTCTA
S6	GAAGCGTTCAACTAGCAGACCATTATCAACAAAATACTCC
S7	GGACAGGGCCATCGCCAATTGGAGTATTTTGTTGATAATG
S8	CTGTCCACACAATCTGCCCTTTCGAAAGATCCCAACGAAA
S9	CCATGCCATGTGTAATCCCAGCAGCTGTTACAAACTCAAG
S10	TGGGATTACACATGGCATGGATGAACTATACAAATAGGAG
	II Failure strand analysis for HPLC, trityl-on / off
40b	TTCTTGTTGAATTAGATGGTGATGTTAATGGGCACAAATT
39b	TCTTGTTGAATTAGATGGTGATGTTAATGGGCACAAATT
38b	CTTGTTGAATTAGATGGTGATGTTAATGGGCACAAATT
35b	GTTGAATTAGATGGTGATGTTAATGGGCACAAATT
31b	AATTAGATGGTGATGTTAATGGGCACAAATT
20b	GATGTTAATGGGCACAAATT
	III Secondary structure and temperature studies, trityl-on / off
S11	ACCAGATGGCTGTTCTAGAACCGCTGACGCTGGTTCTCCAGCTGGTTCTGCTTGTGCTGA
S12	GTAAGGCTATCCAATTGCACCCATTGGTTTGTGCTGCTTACAACGCTGACTTCGATGGTG
S13	GTCACTACTTTCTCTTATGGTGTTCAATGCTTTTCAAGATACCCAGATCATATGAAACGG
S14	TTGGAATACAACTATAACTCACACAATGTATACATCATGGCAGACAAACAAAAGAATGGA
	IV PAGE purified samples (IDT), trityl-off
40b	TTCTTGTTGAATTAGATGGTGATGTTAATGGGCACAAATT
Biotin	Biotin-TTTTTTTTTTTTTTTTTTTT
Amine	Amine-TTTTTTTTTTTTTTTTTTTT
Phosphate	Phosphate-TTTTTTTTTTTTTTTTTTT

Table 1 Sequences for oligonucleotides used for this research (5’ — 3’)

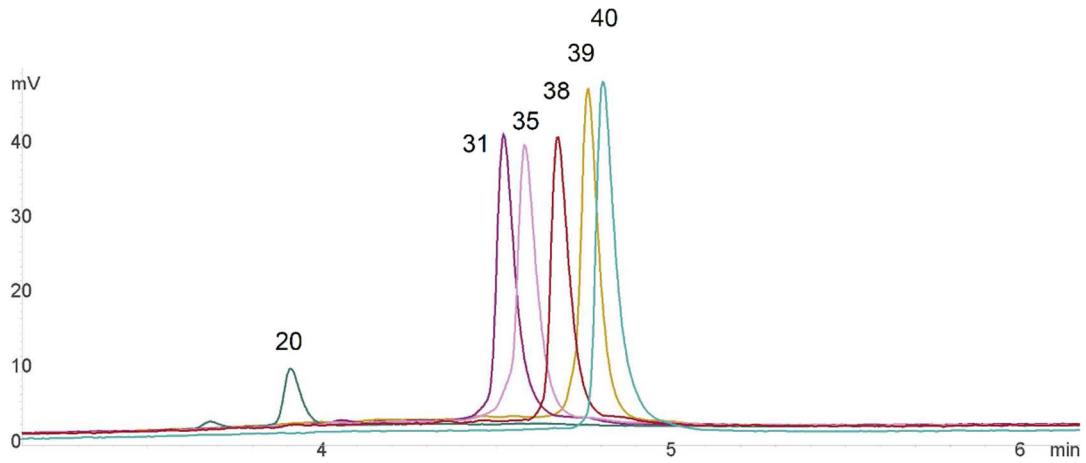

Fig. 1 Control 5' truncated 'failure' strands processed with ion-pairing RP HPLC. This chromatogram shows oligonucleotide strand resolution between 40b - 39b, 39b - 38b, 38b - 35b, 35b - 31b and 31b - 20b, where gradient and method have been optimized for enhanced peak-peak resolution relative to the full-length 40b strand.

	30m 30 U RecJ	30m 30 U RecJ 0.5 ug SSBP	30m 30 U RecJ	30m 30 U RecJ 0.5 ug SSBP	30m 30 U RecJ	30m 30 U RecJ 0.5 ug SSBP	30m 30 U RecJ	30m 30 U RecJ 0.5 ug SSBP
	Total digested (pm)	Total digested (pm)	Failures digested (pm)	Failures digested (pm)	Percent failure decrease	Percent failure decrease	Increase purity	Increase purity
Sample								
S1	20.4	59.2	4	12	15	43	0.8	2.6
S2	11	34.3	10	31	15	47	2.1	7.9
S3	17.4	35.7	13	20	33	52	3.2	5.1
S4	14	30	6	22	20	81	1.3	5.8
S5	18.6	26	17	24	29	40	4.6	6.3
S6	14.1	40	9	13	34	45	2.4	3.2
S7	7.9	30.9	8	30	8	28	0.8	6
S8	8.1	19.6	10	20	27	56	2	4.2
S9	8.3	34	9	29	10	32	1.4	5.7
S10	17.9	54.5	22	44	31	61	4.8	9.7
Average	14	36	11	25	22	49	2	6
Standard deviation	5	12	5	9	10	15	1	2

Table 2 Digestive performance of 30 U RecJ (+ / - 0.5 ug SSBP) on 10 unique 40b samples (crude trityl-on 500 pm) over 30 minutes incubation at 37°C.

	60m 30 U RecJ	60m 30 U RecJ 0.5 ug SSBP	60m 30 U RecJ	60m 30 U RecJ 0.5 ug SSBP	60m 30 U RecJ	60m 30 U RecJ 0.5 ug SSBP	60m 30 U RecJ	60m 30 U RecJ 0.5 ug SSBP
Sample	Total digested (pm)	Total digested (pm)	Failures digested (pm)	Failures digested (pm)	Percent failure decrease	Percent failure decrease	Increase purity	Increase purity
S1	35	68	15	10	55	36	3.8	1.9
S2	27.4	53.9	25	49	38	73	6	13.3
S3	23.1	52.4	20.8	45.6	30.2	55.3	5.3	8
S4	11.4	39.9	18.4	35.3	29	62.1	3.9	8.5
S5	22.1	59.7	15.6	34.5	28.3	52.1	5	7.5
S6	28.2	49.3	14.1	27.3	29.9	47	4.7	7.3
S7	4.2	48.5	6	47	6	44	0.1	10
S8	22.7	60	13	24	37	66	2.7	5
S9	12.7	38.9	16	38	17	41	3.1	7.8
S10	28.2	57.2	25	40	35	56	5.5	8.7
Average	22	53	17	35	31	53	4	8
Standard deviation	9	9	6	12	13	12	2	3

Table 3 Digestive performance of 30 U RecJ (+ / - 0.5 ug SSBP) on 10 unique 40b samples (crude trityl-on 500 pm) over 60 minutes incubation at 37°C.

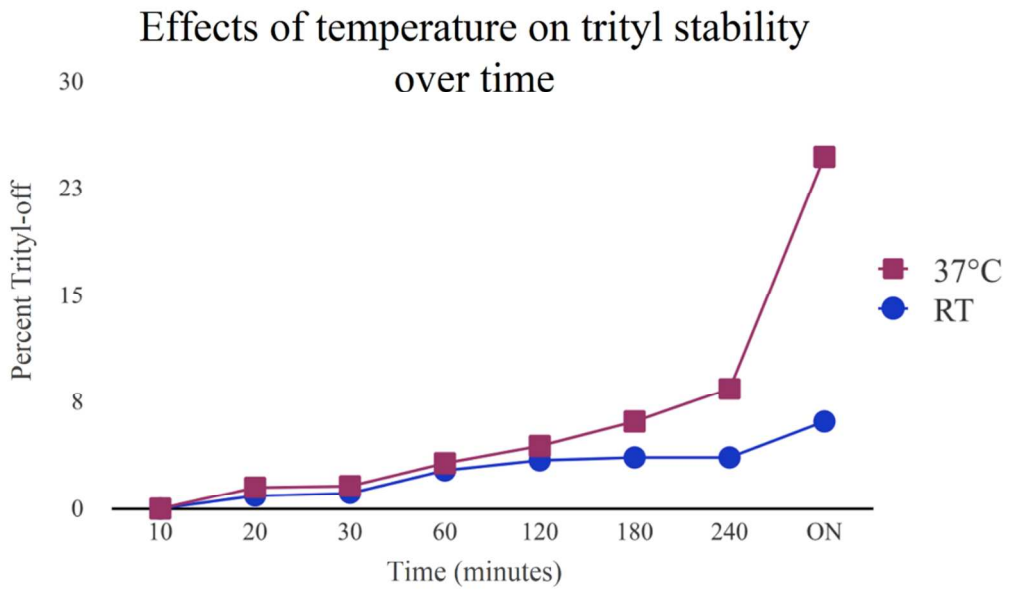

Fig. 2 Effects of time and temperature on the rate of detritylation. Each plot point (time of sample collection) represents an average of three samples (Supplementary Table 1 III) where the percent detritylation was measured (percent peak area from RP HPLC analysis report). (RT, room temperature; ON, overnight; 5 uM ssDNA in water and 1x Buffer 2 at pH 7).

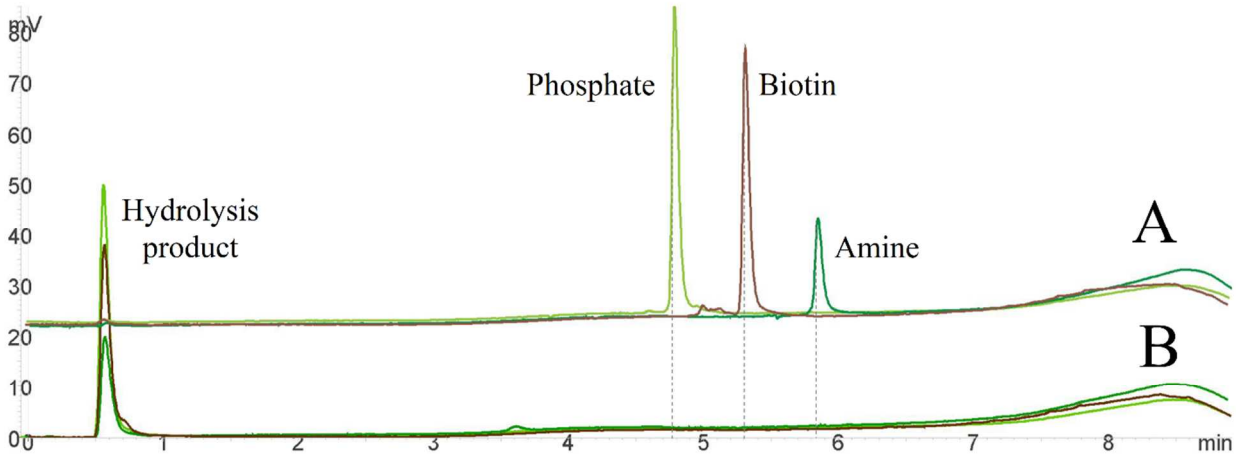

Fig. 3 RecJ-SSBP digestion of oligonucleotides modified at the 5' end with phosphate, biotin and amine (each 20 pm). This figure shows overlapping RP HPLC chromatograms before (A) and after (B) treatment with 30 U RecJ and 0.5 ug SSBP for 60 min at 37°C.