WHAT IS CLAIMED IS:

1. A method of amplifying DNA comprising:

a) providing linear double stranded DNA molecules having complementary sequences;

b) attaching single-stranded adaptors to both ends of the linear double stranded DNA molecules to produce single stranded, covalently closed DNA molecules; wherein the adaptors have a hairpin structure, wherein the adaptors comprise an XTC priming sequence, wherein X is adenine (A), cytosine (C), guanine (G) or thymine (T) and wherein the XTC priming sequence is located in the non-complementary portion of the adaptors; and

c) amplifying the single-stranded, covalently closed DNA molecules in a single operation by (i) rolling circle amplification and (ii) multiple displacement amplification wherein rolling circle amplification produces a concatenated molecule that folds back on itself, forming double-stranded segments based on the complementary sequences, and wherein multiple displacement amplification comprises using a Thermus thermophilus primase/polymerase (TthPrimPol) to prime strand extension from the adaptors on the double stranded segments of the folded, concatenated molecules; and strand extension with a polymerase having strand displacement activity.

2. The method of claim 1, wherein the linear double stranded DNA molecules comprise apoptotic cell free DNA molecules, e.g., having sizes less than 480 bp, less than 320 bp, or between about 140 bp and 180 bp (e.g., averaging about 160 bp).

3. The method of claim 1 or claim 2, wherein the linear double stranded DNA is derived from one or more bodily fluids from mammals, e.g., selected from CSF, blood, plasma, serum, ascites, urine, saliva, tear drops, milk, semen and synovial fluid.

4. The method of any of claims 1 to 3, wherein providing the linear double stranded DNA comprises end-repair and/or dA-tailing.

5. The method of claim 1, comprising attaching adaptors having the following sequence: 5TAACATTT GTT G GCCACT C AG GCCAACAAAT GTTAT3' [SEQ ID NO: 1].

6. The method of claim 1 or claim 5, wherein attaching the adaptors comprises blunt-end ligation or sticky-end ligation.

7. The method of claim 1, comprising:

providing apoptotic cell free DNA molecules;

performing end repair and dA tailing of the cell free DNA molecules; and ligating hairpin adaptors comprising a dT overhang to the end repaired, dA tailed cell free DNA molecules.

8. The method of claim 1, wherein amplification comprises strand extension using Phi29 polymerase.

9. A kit when used in the method of any one of claims 1 to 8 comprising:

(a) the Thermus thermophilus primase/polymerase;

(b) the polymerase having strand displacement activity;

(c) deoxyribonucleotide triphosphates; and

(d) the single stranded adaptor suitable for attachment to linear double stranded DNA molecules, wherein the adaptor comprises an XTC priming sequence, wherein X is adenine (A), cytosine (C), guanine (G) or thymine (T) and wherein the XTC priming sequence is located in the non-complementary portion of the adaptors.