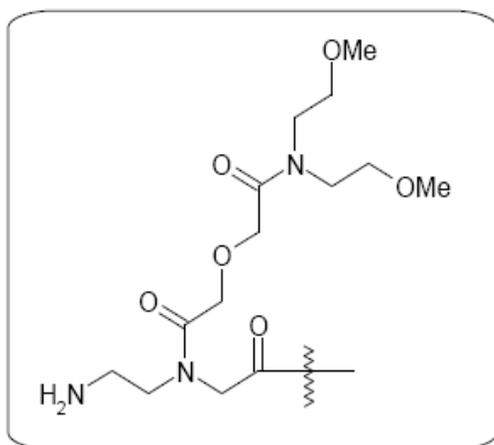


Linkers & Spacers for PNA oligomer

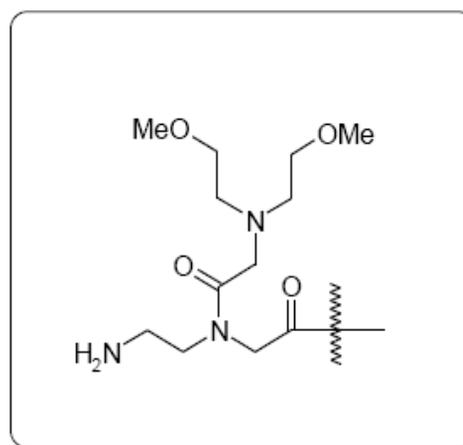
Linkers, reporters, and other molecules may be added to the termini of the PNA probes to enhance solubility, introduce functionality, and allow for conjugation to dyes and other moieties. The information below will help you understand how these molecules are incorporated into a PNA sequence.

1. Solubility Enhancer

E linker and **X linker** are molecules designed to increase the solubility of PNA in aqueous solution and to minimize PNA self-aggregation.



E Linker

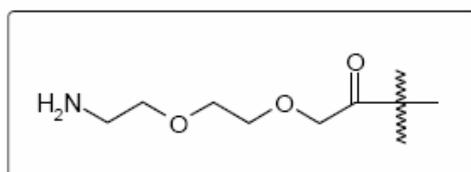


X Linker

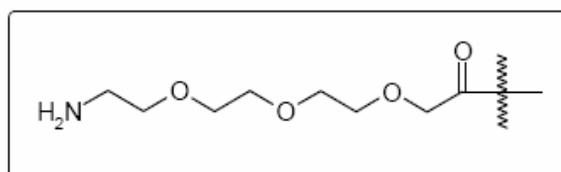
2. Ethylene Glycol Linker

O linker (eg linker, AEEA linker, 1.3 nm long) is a glycol linker of nine atoms used to distance the hybridization portion of the molecule from the reporter molecule. It is added to most labeled sequences between the PNAs and the reporter.

AEEEA linker is another glycol linker (**1.8 nm long**)



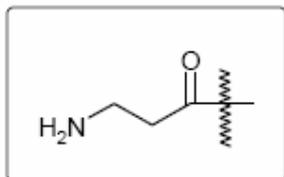
O linker (egl, AEEA)
: 1.3 nm and 9 atoms



AEEEA linker
: 1.8 nm and 12 atoms

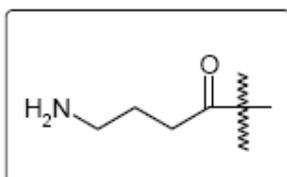
3. Hydrocarbon chain Linker (Amine)

According to the number of carbon atoms, there are **C3A**, **C4A**, **C6A** and **C12A** linkers. These linkers are more hydrophobic than ethylene glycol linker.



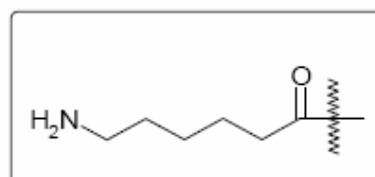
C3A

: 0.6 nm and 4 atoms



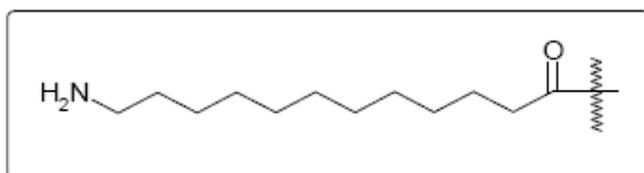
C4A

: 0.8 nm and 5 atoms



C6A

: 1.1 nm and 7 atoms

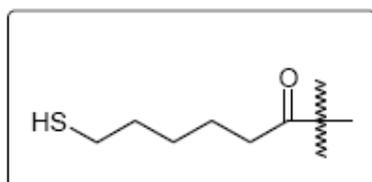


C12A

: 2.0 nm and 13 atoms

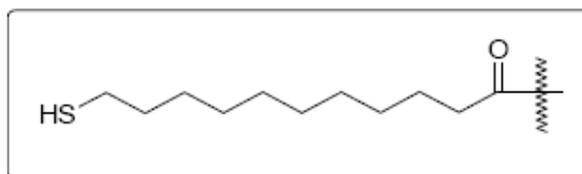
4. Hydrocarbon chain Linker (Thiol)

These Linkers are used for thiol modification of PNA.



C6M

: 1.1 nm and 7 atoms



C11M

: 1.9 nm and 12 atoms

5. Amino Acids

All kinds of amino acid can be conjugated with PNA by standard peptide coupling procedure.

Lysine is mainly used to enhance the aqueous solubility of PNA or to conjugate a reporter molecule at C-terminus of PNA.

Cysteine is mainly used for thiol modification of PNA at N-terminus.

Other amino acid or peptides may be conjugated to improve the cell permeability of PNA.