

CLAIMS

1. A targeted templated assembly reactant comprising:
 - a) at least one nucleic acid recognition moiety that binds a target nucleic acid sequence; wherein the target nucleic acid sequence is selected from a cancer-specific nucleic acid sequence, a viral nucleic acid sequence, a microbial-specific nucleic acid sequence, a differentially expressed gene, a disease-specific nucleic acid sequence;
 - b) at least one effector partial moiety, wherein the molecular size of the effector partial moiety is less than about 20 kDA; and
 - c) at least one selectively-reactive moiety, wherein the selectively-reactive moiety is a bio-orthogonal moiety selected from the group consisting of an azide, a cyclooctyne, a nitron, a norbornene, an oxanorbornadiene, a phosphine, a dialkyl phosphine, a trialkyl phosphine, a phosphinothiol, a phosphinophenol, a cyclooctene, a nitrile oxide, a thioester, a tetrazine, an isonitrile, a tetrazole, and a quadricyclane;wherein the reactant is capable of reacting with a different corresponding templated assembly reactant to produce an active effector structure.
2. The reactant of claim 1, wherein the nucleic acid recognition moiety is a nucleic acid-binding oligomer or a nucleic acid oligomer that hybridizes to the target nucleic acid sequence.
3. The reactant of claim 1, wherein the active effector structure regulates at least one of enzyme activity, gene/protein expression, molecular signaling, and molecular interaction or possesses targeted activity as compared to an activity of the effector partial moiety.
4. The reactant of claim 1 further comprising a chemical linker between any of the nucleic acid recognition moiety and the selectively-reactive moiety, and the selectively-reactive moiety and the effector partial moiety, wherein the chemical linker is at least one of a flexible moiety, cleavage site, and chemical modification site.

5. The reactant of claim 1, wherein the nucleic acid recognition moiety is an oligomer selected from the group consisting of DNA nucleotides, RNA nucleotides, phosphorothioate-modified nucleotides, 2-O-alkylated RNA nucleotides, halogenated nucleotides, locked nucleic acid nucleotides (LNA), peptide nucleic acids (PNA), morpholino nucleic acid analogues (morpholinos), pseudouridine nucleotides, xanthine nucleotides, hypoxanthine nucleotides, 2-deoxyinosine nucleotides, other nucleic acid analogues capable of base-pair formation, and combinations thereof; and wherein the effector partial moiety is selected from the group consisting of a peptide, a non-active portion of a peptidomimetic structure, a non-active portion of a drug, and other bioactive compound.
6. A method of synthesizing the templated assembly reactant of claim 1, said method comprising:
 - generating at least one nucleic acid recognition moiety that is capable of binding a target nucleic acid sequence;
 - generating at least one selectively-reactive moiety that is capable of binding a corresponding selectively-reactive moiety;
 - generating at least one effector partial moiety that is capable of reacting with a corresponding effector partial moiety to produce an active effector structure; and
 - determining competency of the nucleic acid recognition moiety, selectively-reactive moiety, and the effector partial moiety to produce the active effector structure.
7. A method of synthesizing an active effector structure, said method comprising:
 - generating at least two templated assembly reactants according to claim 1;
 - contacting the targeted templated assembly reactants to a target nucleic acid sequence;and
 - producing an active effector structure.
8. A method of delivering at least two targeted templated assembly reactants to a pathogenic cell, said method comprising:

providing a therapeutically effective amount of the targeted templated assembly reactants according to claim 1 to be administered to the pathogenic cell, wherein:

at least one nucleic acid recognition moiety binds a target nucleic acid sequence within the target pathogenic cell; and

producing at least one active effector structure in the pathogenic cell;

wherein the method further comprises the step of detecting the presence or absence of the target nucleic acid sequence prior to the administration of the targeted templated assembly reactants.

9. The method of claim 8, wherein the templated assembly reactants are comprised of two or more sets of nucleic acid recognition moieties that are capable of binding two or more target nucleic acid sequences, where the two or more target nucleic acid sequences are found within the same gene transcript, or different gene transcripts or wherein the templated assembly reactants are comprised of two or more sets effector partial moieties capable of producing two or more active effector structures.

10. The method of claim 8, wherein the pathogenic cell is selected from the group consisting of a virus infected cell, a tumor cell, a cell infected with a microbe, and a cell that produces a disease-inducing or disease modulating molecule that may cause inflammation, allergy or autoimmune pathology.