WHAT IS CLAIMED IS:

1. A method of modifying a gene encoding or processed into a non-coding RNA molecule having no RNA silencing activity in a eukaryotic cell, with the proviso that said eukaryotic cell is not a plant cell, the method comprising introducing into the eukaryotic cell a DNA editing agent conferring a silencing specificity of said non-coding RNA molecule towards a target RNA of interest, thereby modifying the gene encoding or processed into the non-coding RNA molecule.

2. A method of modifying a gene encoding or processed into a RNA silencing molecule to a target RNA in a eukaryotic cell, with the proviso that said eukaryotic cell is not a plant cell, the method comprising introducing into the eukaryotic cell a DNA editing agent which redirects a silencing specificity of said RNA silencing molecule towards a second target RNA, said target RNA and said second target RNA being distinct, thereby modifying the gene encoding the RNA silencing molecule.

3. The method of claim 1, wherein the gene encoding or processed into the non-coding RNA molecule is endogenous to the eukaryotic cell.

4. The method of claim 2, wherein the gene encoding the RNA silencing molecule is endogenous to the eukaryotic cell.

5. The method of any one of claims 1 or 3, wherein said modifying said gene encoding or processed into said non-coding RNA molecule comprises imparting said non-coding RNA molecule with at least 45 % complementarity towards said target RNA of interest.

6. The method of any one of claims 2 or 4, wherein said modifying said gene encoding said RNA silencing molecule comprises imparting said RNA silencing molecule with at least 45 % complementarity towards said second target RNA.

7. The method of any one of claims 1, 3 or 5, wherein said silencing specificity of said non-coding RNA molecule is determined by measuring a RNA or protein level of said target RNA of interest.

8. The method of any one of claims 2, 4 or 6, wherein said silencing specificity of said RNA silencing molecule is determined by measuring a RNA or protein level of said second target RNA.

9. The method of any one of claims 1-8, wherein said silencing specificity of the non-coding RNA molecule or the RNA silencing molecule is determined phenotypically.

10. The method of claim 9, wherein said determined phenotypically is effected by determination of at least one phenotype selected from the group consisting of a cell size, a growth rate/inhibition, a cell shape, a cell membrane integrity, a tumor size, a tumor shape, a pigmentation of an organism, an infection parameter and an inflammation parameter.

11. The method of any one of claims 1-10, wherein said silencing specificity of the non-coding RNA molecule or the RNA silencing molecule is determined genotypically.

12. The method of claim 11, wherein a phenotype is determined prior to a genotype.

13. The method of claim 11, wherein a genotype is determined prior to a phenotype.

14. The method of any one of claims 1-13, wherein said non-coding RNA molecule or said RNA silencing molecule is processed from a precursor.

15. The method of any one of claims 1-14, wherein said non-coding RNA molecule or said RNA silencing molecule is a RNA interference (RNAi) molecule.

16. The method of claim 15, wherein said RNAi molecule is selected from the group consisting of a small interfering RNA (siRNA), a short hairpin RNA (shRNA), a microRNA (miRNA), a Piwi-interacting RNA (piRNA) and trans-acting siRNA (tasiRNA).

17. The method of any one of claims 1, 3, 5, 7, or 9-14, wherein said non-coding RNA molecule is selected from the group consisting of a small nuclear RNA (snRNA), a small nucleolar RNA (snoRNA), a long non-coding RNA (lncRNA), a ribosomal RNA (rRNA), transfer RNA (tRNA), a repeat-derived RNA, and a transposable element RNA.

18. The method of claim 15 or 16, wherein said RNAi molecule is modified to preserve originality of structure and to be recognized by cellular RNAi factors.

19. The method of any one of claims 1-18, wherein said modifying said gene is affected by a modification selected from the group consisting of a deletion, an insertion, a point mutation and a combination thereof.

20. The method of claim 19, wherein said modification is in a stem region of said non-coding RNA molecule or said RNA silencing molecule.

21. The method of claim 19, wherein said modification is in a loop region of said non-coding RNA molecule or said RNA silencing molecule.

22. The method of claim 19, wherein said modification is in a non-structured region of said non-coding RNA molecule or said RNA silencing molecule.

23. The method of claim 19, wherein said modification is in a stem region and a loop region of said non-coding RNA molecule or said RNA silencing molecule.

24. The method of claim 19, wherein said modification is in a stem region and a loop region and in non-structured region of said non-coding RNA molecule or said RNA silencing molecule.

25. The method of any one of claims 19-24, wherein said modification comprises a modification of at most 200 nucleotides.

26. The method of any one of claims 19-25, wherein said method further comprises introducing into said eukaryotic cell donor oligonucleotides.

27. The method of any one of claims 1-26, wherein said DNA editing agent comprises at least one gRNA operatively linked to a plant expressible promoter.

28. The method of any one of claims 1-27, wherein said DNA editing agent does not comprise an endonuclease.

29. The method of any one of claims 1-27, wherein said DNA editing agent comprises an endonuclease.

30. The method of any one of claims 1-29, wherein said DNA editing agent comprises a DNA editing system selected from the group consisting of a meganuclease, a zinc finger nucleases (ZFN), a transcription-activator like effector nuclease (TALEN) and CRISPR.

31. The method of any one of claims 29 or 30, wherein said endonuclease comprises Cas9.

32. The method of any one of claims 1-31, wherein said DNA editing agent is applied to the cell as DNA, RNA or RNP.

33. The method of any one of claims 1-32, wherein said DNA editing agent is linked to a reporter for monitoring expression in a eukaryotic cell.

34. The method of claim 33, wherein said reporter is a fluorescent protein.

35. The method of any one of claims 1-34, wherein said target RNA of interest or said second target RNA is endogenous to said eukaryotic cell.

36. The method of claim 35, wherein said target RNA of interest or said second target RNA is associated with a cancer.

37. The method of any one of claims 1-34, wherein said target RNA of interest or said second target RNA is exogenous to said eukaryotic cell.

38. The method of claim 37, wherein said target RNA of interest or said second target RNA is associated with an infectious disease.

39. The method of any one of claims 1-38, wherein said eukaryotic cell is obtained from a eukaryotic organism selected from the group consisting of a mammal, an insect, a nematode, a bird, a reptile, a fish, a crustacean, a fungi and an algae.

40. The method of any one of claims 1-39, wherein said eukaryotic cell is a mammalian cell.

41. The method of claim 40, wherein said mammalian cell comprises a human cell.

42. The method of any one of claims 1-41, wherein said eukaryotic cell is a totipotent stem cell.

43. A method of treating an infectious disease in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42, wherein said target RNA of interest is associated with onset or progression of said infectious disease, thereby treating the infectious disease in the subject.

44. A method of treating a monogenic recessive disorder in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42, wherein said target RNA of interest is associated with said monogenic recessive disorder, thereby treating the monogenic recessive disorder in the subject.

45. A method of treating an autoimmune disease in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42, wherein said target RNA of interest is associated with said autoimmune disease, thereby treating the autoimmune disease in the subject.

46. A method of treating a cancerous disease in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42,

wherein said target RNA of interest is associated with said cancerous disease, thereby treating the cancerous disease in the subject.

47. A method of enhancing efficacy and/or specificity of a chemotherapeutic agent in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42, wherein said target RNA of interest is associated with enhancement of efficacy and/or specificity of said chemotherapeutic agent, thereby enhancing efficacy and/or specificity of a chemotherapeutic agent in the subject.

48. A method of inducing cell apoptosis in a subject in need thereof, the method comprising modifying a gene encoding or processed into a non-coding RNA molecule or encoding or processed into an RNA silencing molecule according to the method of any one of claims 1-42, wherein said target RNA of interest is associated with said apoptosis, thereby inducing cell apoptosis in the subject.

49. A method of generating a eukaryotic non-human organism, with the proviso that said organism is not a plant, wherein at least some of the cells of said organism comprise a modified gene encoding or processed into a non-coding RNA molecule comprising a silencing specificity towards a target RNA of interest, the method comprising modifying a gene according to the method of any one of claims 1-42, thereby generating the eukaryotic non-human organism.