

CLAIMS

1. Use of at least one gene or its gene product selected from RCN2 (SEQ ID NO:3), ACTR6 (SEQ ID NO:1), GIMAP2 (SEQ ID NO:2), RPL22L1 (SEQ ID NO:4), TRIAP1 (SEQ ID NO:5), NIFK (SEQ ID NO:6), APIP (SEQ ID NO:7), GEMIN6 (SEQ ID NO:8), RWDD1 (SEQ ID NO:9), ZNF613 (SEQ ID NO:10), BPNT1 (SEQ ID NO:11), CCT2 (SEQ ID NO:12) and LYRM2 (SEQ ID NO:13) as a biomarker for *in vitro* or *ex vivo* detection of muscle atrophy in a blood sample.
2. An *in vitro* or *ex vivo* method for diagnosing muscle atrophy in a subject, comprising determining the expression level of at least one biomarker selected from RCN2 (SEQ ID NO:3), ACTR6 (SEQ ID NO:1), GIMAP2 (SEQ ID NO:2), RPL22L1 (SEQ ID NO:4), TRIAP1 (SEQ ID NO:5), NIFK (SEQ ID NO:6), APIP (SEQ ID NO:7), GEMIN6 (SEQ ID NO:8), RWDD1 (SEQ ID NO:9), ZNF613 (SEQ ID NO:10), BPNT1 (SEQ ID NO:11), CCT2 (SEQ ID NO:12) and LYRM2 (SEQ ID NO:13) in a blood sample obtained from the subject; wherein a reduction in expression level of said at least one biomarker as compared to a reference value is indicative of muscle atrophy in the subject.
3. The method of claim 2, wherein the at least one biomarker is selected from RCN2, ACTR6, and GIMAP2, or a combination thereof, and wherein a reduction in expression level of said at least one biomarker, or a combination thereof, as compared to a reference value is indicative of muscle atrophy.
4. The method of claim 3, which comprises determining the expression level of one of the following combinations of biomarkers: ACTR6 and RCN2, GIMAP2 and RCN2, ACTR6 and GIMAP2 and RCN2, or ACTR6 and GIMAP2.
5. The method of claim 3 or 4, which method further comprises determining the expression level of at least one further biomarker selected from RPL22L1, TRIAP1, NIFK, APIP, GEMIN6, RWDD1, ZNF613, BPNT1, CCT2 and LYRM2.
6. An *in vitro* or *ex vivo* method for assessing the efficacy of a treatment to reverse muscle atrophy in a subject, comprising the steps of:
 - (i) determining the expression level of at least one biomarker selected from RCN2, ACTR6, GIMAP2, RPL22L1, TRIAP1, NIFK, APIP, GEMIN6, RWDD1, ZNF613, BPNT1, CCT2 and LYRM2 in a first blood sample from the subject obtained prior to said treatment or at an early stage of said treatment; and

- (ii) determining the expression level of the same at least one biomarker in a second blood sample from the subject obtained during, at a later stage, or after said treatment; wherein an expression level of the at least one biomarker as measured in step (ii) above the expression level of the same at least one biomarker as measured in step (i) is indicative that the treatment is effective.
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7. An *in vitro* or *ex vivo* method for helping in selecting, adapting or changing treatment in a subject suffering from a disease, comprising the steps of:
- (i) assessing the presence of muscle atrophy in the subject by a method according to any one of claims 2 to 5; and
- 10 (ii) taking into account the presence of muscle atrophy for selecting, adapting or changing treatment in the subject suffering from a disease.
8. The *in vitro* or *ex vivo* method of claim 7, further comprising a step (iii) of selecting a therapy for muscle atrophy, wherein said therapy comprises drugs (pharmacological agents such as glucocorticoids, anti-inflammatory drugs), nutritional agents (such as dietary supplements, ursolic acid, tomatidine), exercise, or a combination thereof.
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9. The *in vitro* or *ex vivo* method of any one of claims 2 to 8, wherein the expression level of the at least one biomarker is determined at the nucleic acid level.
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10. The *in vitro* or *ex vivo* method of claim 9, wherein the expression level of at least one biomarker is determined using real time reverse transcription polymerase chain reaction (RT-PCR), real time reverse transcription quantitative polymerase chain reaction (RT-qPCR), digital PCR, RNAseq, microarrays, gene chips, nCounter Gene Expression Assay, Serial Analysis of Gene Expression (SAGE), Rapid Analysis of Gene Expression (RAGE), nuclease protection assays, Northern blotting, or any other equivalent gene expression detection technique.
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11. The *in vitro* or *ex vivo* method of claim 9, wherein the expression level of at least one biomarker is determined using real time reverse transcription quantitative polymerase chain reaction (RT-qPCR) or digital PCR.
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12. The *in vitro* or *ex vivo* method of claim 11, wherein the expression level of at least one biomarker is determined using absolute real time reverse transcription quantitative polymerase chain reaction (RT-qPCR) or digital PCR.
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13. The method of any one of claims 2 to 12, wherein the subject is a mammal, preferably a human subject, even more preferably an adult human subject.
14. The use of claim 1 or method of any one of claims 2 to 13, wherein the blood sample is selected from peripheral blood, plasma and serum sample.
15. Oligonucleotide having a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 14-39.
16. A kit comprising at least two oligonucleotides of claim 15 for amplifying of at least one biomarker selected from RCN2, ACTR6, GIMAP2, RPL22L1, TRIAP1, NIFK, APIP, GEMIN6, RWDD1, ZNF613, BPNT1, CCT2 and LYRM2, and optionally reagents for performing amplification reaction and/or instructions for use.
17. Use of a kit of claim 16 on a blood sample for diagnosing muscle atrophy; for assessing the efficacy of a treatment to reverse muscle atrophy; for assessing the occurrence or the risk of occurrence of a disease in a subject and/or for helping in selecting, adapting or changing treatment in a subject suffering from a disease.