Stem Cell Reports, Volume *12*

Supplemental Information

Anti-apoptotic Regulation Contributes to the Successful Nuclear Reprogramming Using Cryopreserved Oocytes

Ah Reum Lee, Kwonho Hong, Seo Hye Choi, Chanhyeok Park, Jae Kyun Park, Jin Il Lee, Jae Il Bang, Dong-Won Seol, Jeoung Eun Lee, and Dong Ryul Lee

Title: Anti-apoptotic regulation contributes successful nuclear reprogramming using cryopreserved oocytes

Authors:

Ah Reum Lee[1,5], Kwon Ho Hong[2,5], Seo Hye Choi[1], Chan Hyeok Park[2], Jae Kyun Park[3], Jin Il Lee[3], Jae Il Bang[1], Dong-Wong Seol[1], Jeoung Eun Lee, Dong Ryul Lee [1,4,*]

[1] Department of Biomedical Science, College of Life Science, CHA University, Seoul, Korea.

[2] Department of Stem Cell and Regenerative Biotechnology, Konkuk University, Seoul, Korea.

[3] Fertility Center of CHA Gangnam Medical Center, College of Medicine, CHA University, Seoul, Korea.

[4] CHA Stem Cell Institute, CHA University, Seoul, Korea.

[5] These authors contributed equally to this study.

[*] ***To whom correspondence may be addressed:*** **Dong Ryul Lee, Ph.D.,** Department of Biomedical Science, College of Life Science, CHA University, 335 Pankyo-ro, Seongnam-si, Gyeonggi-do 13488, Korea. Tel: +82-31-881-7136, Fax: +82-31-881-7100, E-mail: drleedr@cha.ac.kr

Running Head: *Somatic cell nuclear transfer using cryopreserved oocytes*

Acknowledgement: This research was supported partly by the Bio & Medical Technology Development Program of the National Research Foundation (NRF) and funded by the Korean government MSIT (2015M3A9C6028961, 2017M3A9C6061284 and 2017M3A9C8029318). All authors state that they have no conflicts of interest to disclose.

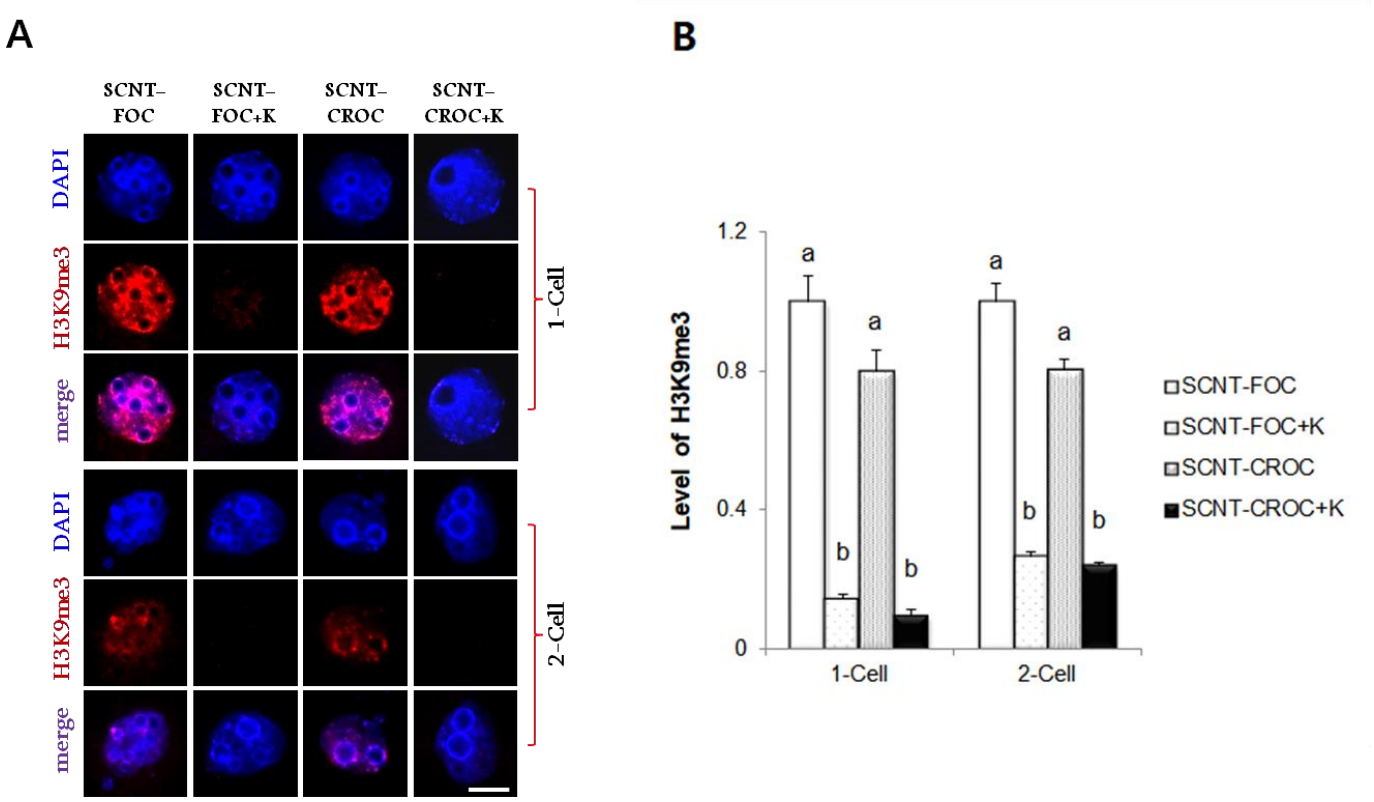

FIGURE S1. Injection of *Kdm4a* mRNA removes H3K9me3 of SCNT embryos using fresh oocyte cytoplasm (SCNT-FOC) and cryopreserved oocyte cytoplasm (SCNT-CROC) at the 1-cell and 2-cell stage (related to Table 1). A) Representative nuclear images of 1-cell and 2-cell stage SCNT embryos stained with anti-H3K9me3 and DAPI. Shown in each panel is a nucleus of a single blastomere. Scale bar, 10 μm. B) Bar graph showing reduced expression intensity of H3K9me3 between cloned embryos from SCNT-FOC and SCNT-CROC groups at the 1-cell and 2-cell stage.

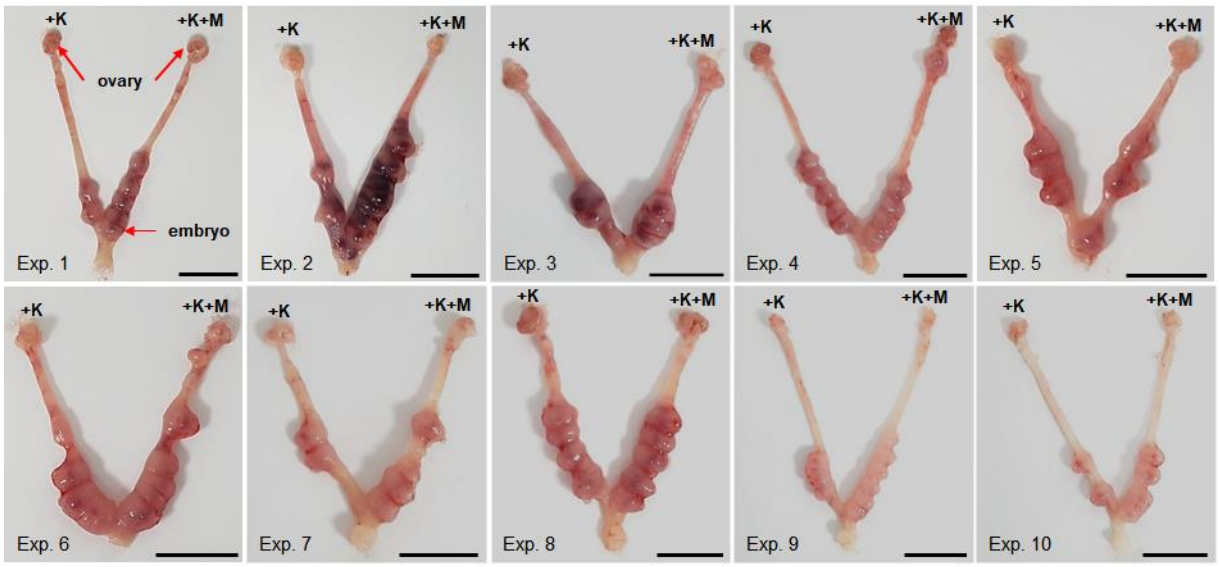

FIGURE S2. Photographs of uteri with implantation sites at day 7 (related to Fig.4). Allows indicate ovary and implantation site, respectively. In 9 out of 11 experiments, the number of implantation sites was increased in the SCNT-CROC+M+K group compared to those in the SCNT-CROC+K group.

Reference of Table S1 and S2

1. GU B, ZHANG J, CHEN Q et al. Aire regulates the expression of differentiation-associated genes and self-renewal of embryonic stem cells. Biochemical and biophysical research communications 2010; **394**:418-23.
2. SHEN Y, MCMACKIN MZ, SHAN Y et al. Frataxin Deficiency Promotes Excess Microglial DNA Damage and Inflammation that Is Rescued by PJ34. PloS one 2016; **11**:e0151026.
3. CARLETTI B, PIERMARINI E, TOZZI G et al. Frataxin silencing inactivates mitochondrial Complex I in NSC34 motoneuronal cells and alters glutathione homeostasis. International journal of molecular sciences 2014; **15**:5789-806.
4. CALMELS N, SCHMUCKER S, WATTENHOFER-DONZE M et al. The first cellular models based on frataxin missense mutations that reproduce spontaneously the defects associated with Friedreich ataxia. PloS one 2009; **4**:e6379.
5. PFISTER AS, KEIL M , KUHL M The Wnt Target Protein Peter Pan Defines a Novel p53-independent Nucleolar Stress-Response Pathway. The Journal of biological chemistry 2015; **290**:10905-18.
6. VILLALBA-BENITO L, TORROGLOSA A, FERNANDEZ RM et al. Overexpression of DNMT3b target genes during Enteric Nervous System development contribute to the onset of Hirschsprung disease. Scientific reports 2017; **7**:6221.
7. LEE HJ, PAZIN DE, KAHLON RS et al. Novel markers of early ovarian pre-granulosa cells are expressed in an Sry-like pattern. Developmental dynamics : an official publication of the American Association of Anatomists 2009; **238**:812-25.
8. HOPKINS J, HWANG G, JACOB J et al. Meiosis-specific cohesin component, Stag3 is essential for maintaining centromere chromatid cohesion, and required for DNA repair and synapsis between homologous chromosomes. PLoS genetics 2014; **10**:e1004413.
9. LLANO E, GOMEZ HL, GARCIA-TUNON I et al. STAG3 is a strong candidate gene for male infertility. Human molecular genetics 2014; **23**:3421-31.
10. FUKUDA T, FUKUDA N, AGOSTINHO A et al. STAG3-mediated stabilization of REC8 cohesin complexes promotes chromosome synapsis during meiosis. The EMBO journal 2014; **33**:1243-55.
11. BREUSS MW, SULTAN T, JAMES KN et al. Autosomal-Recessive Mutations in the tRNA Splicing Endonuclease Subunit TSEN15 Cause Pontocerebellar Hypoplasia and Progressive Microcephaly. American journal of human genetics 2016; **99**:228-35.
12. ZHAO XS, FU WY, HUNG KW et al. NRC-interacting factor directs neurite outgrowth in an activity-dependent manner. Neuroscience 2015; **289**:207-13.
13. YANG YJ, BALTUS AE, MATHEW RS et al. Microcephaly gene links trithorax and REST/NRSF to control neural stem cell proliferation and differentiation. Cell 2012; **151**:1097-112.
14. HAYASHI M, TOJO A, SHIMOSAWA T et al. The role of adrenomedullin in the renal NADPH oxidase and (pro)renin in diabetic mice. Journal of diabetes research 2013; **2013**:134395.
15. VERGANO-VERA E, FERNANDEZ AP, HURTADO-CHONG A et al. Lack of adrenomedullin affects growth and differentiation of adult neural stem/progenitor cells. Cell and tissue research 2010; **340**:1-11.
16. ALBERTSEN M, TEPEREK M, ELHOLM G et al. Localization and differential expression of the Kruppel-associated box zinc finger proteins 1 and 54 in early mouse development. DNA and cell biology 2010; **29**:589-601.

17. JIANG J, LV W, YE X et al. Zscan4 promotes genomic stability during reprogramming and dramatically improves the quality of iPS cells as demonstrated by tetraploid complementation. Cell research 2013; **23**:92-106.
18. RAUNER M, FOGER-SAMWALD U, KURZ MF et al. Cathepsin S controls adipocytic and osteoblastic differentiation, bone turnover, and bone microarchitecture. Bone 2014; **64**:281-7.
19. WANG B, SUN J, KITAMOTO S et al. Cathepsin S controls angiogenesis and tumor growth via matrix-derived angiogenic factors. The Journal of biological chemistry 2006; **281**:6020-9.
20. ZHENG T, KANG MJ, CROTHERS K et al. Role of cathepsin S-dependent epithelial cell apoptosis in IFN-gamma-induced alveolar remodeling and pulmonary emphysema. Journal of immunology 2005; **174**:8106-15.
21. BOULARES AH, ZOLTOSKI AJ, SHERIF ZA et al. Roles of DNA fragmentation factor and poly(ADP-ribose) polymerase-1 in sensitization of fibroblasts to tumor necrosis factor-induced apoptosis. Biochemical and biophysical research communications 2002; **290**:796-801.
22. YAN B, WANG H, PENG Y et al. A unique role of the DNA fragmentation factor in maintaining genomic stability. Proceedings of the National Academy of Sciences of the United States of America 2006; **103**:1504-9.
23. LEE JY, KIM HJ, RHO SB et al. eIF3f reduces tumor growth by directly interrupting clusterin with anti-apoptotic property in cancer cells. Oncotarget 2016; **7**:18541-57.
24. SHI J, HERSHEY JW , NELSON MA Phosphorylation of the eukaryotic initiation factor 3f by cyclin-dependent kinase 11 during apoptosis. FEBS letters 2009; **583**:971-7.
25. FRACCASCIA P, CASTEELS M, DE SCHRYVER E et al. Role of thiamine pyrophosphate in oligomerisation, functioning and import of peroxisomal 2-hydroxyacyl-CoA lyase. Biochimica et biophysica acta 2011; **1814**:1226-33.
26. ROGON C, ULBRICHT A, HESSE M et al. HSP70-binding protein HSPBP1 regulates chaperone expression at a posttranslational level and is essential for spermatogenesis. Molecular biology of the cell 2014; **25**:2260-71.
27. LENG JJ, TAN HM, CHEN K et al. Growth-inhibitory effects of MOB2 on human hepatic carcinoma cell line SMMC-7721. World journal of gastroenterology 2012; **18**:7285-9.
28. GOMEZ V, GUNDOGDU R, GOMEZ M et al. Regulation of DNA damage responses and cell cycle progression by hMOB2. Cellular signalling 2015; **27**:326-39.
29. SUN XX, DAI MS , LU H 5-fluorouracil activation of p53 involves an MDM2-ribosomal protein interaction. The Journal of biological chemistry 2007; **282**:8052-9.
30. LIU L, LUO C, LUO Y et al. MRPL33 and its splicing regulator hnRNPK are required for mitochondria function and implicated in tumor progression. Oncogene 2018; **37**:86-94.
31. WANG J, LIU Y, LIU F et al. Loss-of-function Mutation in PMVK Causes Autosomal Dominant Disseminated Superficial Porokeratosis. Scientific reports 2016; **6**:24226.
32. ROY S, PRANEETHA DC , VENDRA VP Mutations in the Corneal Endothelial Dystrophy-Associated Gene SLC4A11 Render the Cells More Vulnerable to Oxidative Insults. Cornea 2015; **34**:668-74.
33. LIU J, SEET LF, KOH LW et al. Depletion of SLC4A11 causes cell death by apoptosis in an immortalized human corneal endothelial cell line. Investigative ophthalmology & visual science 2012; **53**:3270-9.
34. JANGANI M, POOLMAN TM, MATTHEWS L et al. The methyltransferase WBSCR22/Merm1 enhances glucocorticoid receptor function and is regulated in lung inflammation and cancer. The Journal of

biological chemistry 2014; **289**:8931-46.
35. YAN D, TU L, YUAN H et al. WBSCR22 confers oxaliplatin resistance in human colorectal cancer. Scientific reports 2017; **7**:15443.
36. OUNAP K, KASPER L, KURG A et al. The human WBSCR22 protein is involved in the biogenesis of the 40S ribosomal subunits in mammalian cells. PloS one 2013; **8**:e75686.
37. OKADA R, WU Z, ZHU A et al. Cathepsin D deficiency induces oxidative damage in brain pericytes and impairs the blood-brain barrier. Molecular and cellular neurosciences 2015; **64**:51-60.
38. YANG D, MENG X, XUE B et al. MiR-942 mediates hepatitis C virus-induced apoptosis via regulation of ISG12a. PloS one 2014; **9**:e94501.
39. CHEN Y, JIAO B, YAO M et al. ISG12a inhibits HCV replication and potentiates the anti-HCV activity of IFN-alpha through activation of the Jak/STAT signaling pathway independent of autophagy and apoptosis. Virus research 2017; **227**:231-239.
40. MCEVOY K, OSBORNE LM, NANAVATI J et al. Reproductive Affective Disorders: a Review of the Genetic Evidence for Premenstrual Dysphoric Disorder and Postpartum Depression. Current psychiatry reports 2017; **19**:94.
41. ZHANG Z, ZHANG G, KONG C et al. METTL13 is downregulated in bladder carcinoma and suppresses cell proliferation, migration and invasion. Scientific reports 2016; **6**:19261.
42. BLADT F, AIPPERSBACH E, GELKOP S et al. The murine Nck SH2/SH3 adaptors are important for the development of mesoderm-derived embryonic structures and for regulating the cellular actin network. Molecular and cellular biology 2003; **23**:4586-97.
43. XIAHOU Z, WANG X, SHEN J et al. NMI and IFP35 serve as proinflammatory DAMPs during cellular infection and injury. Nature communications 2017; **8**:950.
44. WANG J, ZOU K, FENG X et al. Downregulation of NMI promotes tumor growth and predicts poor prognosis in human lung adenocarcinomas. Molecular cancer 2017; **16**:158.
45. MATSUDA S, OKADA N, KODAMA T et al. A cytotoxic type III secretion effector of Vibrio parahaemolyticus targets vacuolar H+-ATPase subunit c and ruptures host cell lysosomes. PLoS pathogens 2012; **8**:e1002803.
46. FAN SH, WANG YY, WU ZY et al. AGPAT9 suppresses cell growth, invasion and metastasis by counteracting acidic tumor microenvironment through KLF4/LASS2/V-ATPase signaling pathway in breast cancer. Oncotarget 2015; **6**:18406-17.
47. WANG H, DONG J, SHI P et al. Anti-mouse CD52 monoclonal antibody ameliorates intestinal epithelial barrier function in interleukin-10 knockout mice with spontaneous chronic colitis. Immunology 2015; **144**:254-62.
48. ISSHIKI K, MATSUDA S, TSUJI A et al. cGMP-dependent protein kinase I promotes cell apoptosis through hyperactivation of death-associated protein kinase 2. Biochemical and biophysical research communications 2012; **422**:280-4.
49. YUASA K, OTA R, MATSUDA S et al. Suppression of death-associated protein kinase 2 by interaction with 14-3-3 proteins. Biochemical and biophysical research communications 2015; **464**:70-5.
50. MORQUETTE B, MORQUETTE P, AGOSTINONE J et al. REDD2-mediated inhibition of mTOR promotes dendrite retraction induced by axonal injury. Cell death and differentiation 2015; **22**:612-25.
51. LUTHER J, GALA M, PATEL SJ et al. Loss of Response to Anti-Tumor Necrosis Factor Alpha Therapy in Crohn's Disease Is Not Associated with Emergence of Novel Inflammatory Pathways. Digestive diseases and sciences 2018; **63**:738-745.

52. MACFIE TS, POULSOM R, PARKER A et al. DUOX2 and DUOXA2 form the predominant enzyme system capable of producing the reactive oxygen species H2O2 in active ulcerative colitis and are modulated by 5-aminosalicylic acid. Inflammatory bowel diseases 2014; **20**:514-24.
53. CHANG NS The non-ankyrin C terminus of Ikappa Balpha physically interacts with p53 in vivo and dissociates in response to apoptotic stress, hypoxia, DNA damage, and transforming growth factor-beta 1-mediated growth suppression. The Journal of biological chemistry 2002; **277**:10323-31.
54. BROUARD S, BERBERAT PO, TOBIASCH E et al. Heme oxygenase-1-derived carbon monoxide requires the activation of transcription factor NF-kappa B to protect endothelial cells from tumor necrosis factor-alpha-mediated apoptosis. The Journal of biological chemistry 2002; **277**:17950-61.
55. OMORI K, MORIKAWA T, KUNITA A et al. Lipocalin-type prostaglandin D synthase-derived PGD2 attenuates malignant properties of tumor endothelial cells. The Journal of pathology 2018; **244**:84-96.
56. ZHANG B, BIE Q, WU P et al. PGD2/PTGDR2 Signaling Restricts the Self-Renewal and Tumorigenesis of Gastric Cancer. Stem cells 2018.
57. MARCHETTE LD, THOMPSON DA, KRAVTSOVA M et al. Retinol dehydrogenase 12 detoxifies 4-hydroxynonenal in photoreceptor cells. Free radical biology & medicine 2010; **48**:16-25.
58. HERNANDEZ-SANCHEZ M, POCH E, GUASCH RM et al. RhoE is required for contact inhibition and negatively regulates tumor initiation and progression. Oncotarget 2015; **6**:17479-90.
59. XUAN DY, LI X, DENG ZH et al. Identification and characterization of a novel gene, Mcpr1, and its possible function in the proliferation of embryonic palatal mesenchymal cells. The Journal of biological chemistry 2006; **281**:33997-4008.
60. SHI R, ZHANG C, WU Y et al. CDCA2 promotes lung adenocarcinoma cell proliferation and predicts poor survival in lung adenocarcinoma patients. Oncotarget 2017; **8**:19768-19779.
61. UCHIDA F, UZAWA K, KASAMATSU A et al. Overexpression of CDCA2 in human squamous cell carcinoma: correlation with prevention of G1 phase arrest and apoptosis. PloS one 2013; **8**:e56381.
62. VAGNARELLI P, RIBEIRO S, SENNELS L et al. Repo-Man coordinates chromosomal reorganization with nuclear envelope reassembly during mitotic exit. Developmental cell 2011; **21**:328-42.
63. PENG A, LEWELLYN AL, SCHIEMANN WP et al. Repo-man controls a protein phosphatase 1-dependent threshold for DNA damage checkpoint activation. Current biology : CB 2010; **20**:387-96.
64. AMIABLE C, POCHET S, PADILLA A et al. N (6)-substituted AMPs inhibit mammalian deoxynucleotide N-hydrolase DNPH1. PloS one 2013; **8**:e80755.
65. FAN Y , GUO Y Knockdown of eIF3D inhibits breast cancer cell proliferation and invasion through suppressing the Wnt/beta-catenin signaling pathway. International journal of clinical and experimental pathology 2015; **8**:10420-7.
66. REN M, ZHOU C, LIANG H et al. RNAi-Mediated Silencing of EIF3D Alleviates Proliferation and Migration of Glioma U251 and U87MG Cells. Chemical biology & drug design 2015; **86**:715-22.
67. MACK DL, BOULANGER CA, CALLAHAN R et al. Expression of truncated Int6/eIF3e in mammary alveolar epithelium leads to persistent hyperplasia and tumorigenesis. Breast cancer research : BCR 2007; **9**:R42.
68. SHAH M, SU D, SCHELIGA JS et al. A Transcript-Specific eIF3 Complex Mediates Global Translational Control of Energy Metabolism. Cell reports 2016; **16**:1891-902.
69. YI P, GAO S, GU Z et al. P44/WDR77 restricts the sensitivity of proliferating cells to TGFbeta signaling. Biochemical and biophysical research communications 2014; **450**:409-15.
70. CHAO YX, HE BP, CAO Q et al. Protein aggregate-containing neuron-like cells are differentiated from bone

marrow mesenchymal stem cells from mice with neurofilament light subunit gene deficiency. Neuroscience letters 2007; **417**:240-5.

71. CAPASSO M, DISKIN S, CIMMINO F et al. Common genetic variants in NEFL influence gene expression and neuroblastoma risk. Cancer research 2014; **74**:6913-24.
72. TAO J, TAO S, HAN J et al. RECQL1 plays an important role in the development of tongue squamous cell carcinoma. Cellular physiology and biochemistry : international journal of experimental cellular physiology, biochemistry, and pharmacology 2014; **33**:1579-90.
73. REN J, YANG Y, XUE J et al. Long noncoding RNA SNHG7 promotes the progression and growth of glioblastoma via inhibition of miR-5095. Biochemical and biophysical research communications 2018; **496**:712-718.
74. SHE K, HUANG J, ZHOU H et al. lncRNA-SNHG7 promotes the proliferation, migration and invasion and inhibits apoptosis of lung cancer cells by enhancing the FAIM2 expression. Oncology reports 2016; **36**:2673-2680.
75. GENG Y, LEE YM, WELCKER M et al. Kinase-independent function of cyclin E. Molecular cell 2007; **25**:127-39.
76. DONANGELO I, REN SG, EIGLER T et al. Sca1(+) murine pituitary adenoma cells show tumor-growth advantage. Endocrine-related cancer 2014; **21**:203-16.
77. TOUSOULIS D, BRIASOULIS A, VOGIATZI G et al. Infusion of lin-/sca-1+ and endothelial progenitor cells improves proinflammatory and oxidative stress markers in atherosclerotic mice. International journal of cardiology 2013; **167**:1900-5.
78. SAINT FLEUR S, HOSHINO A, KONDO K et al. Regulation of Fas-mediated immune homeostasis by an activation-induced protein, Cyclon. Blood 2009; **114**:1355-65.
79. YANG Y, ZHOU QJ, CHEN XQ et al. Profiling of differentially expressed genes in sheep T lymphocytes response to an artificial primary Haemonchus contortus infection. Parasites & vectors 2015; **8**:235.
80. FLOUDAS A, SAUNDERS SP, MORAN T et al. IL-17 Receptor A Maintains and Protects the Skin Barrier To Prevent Allergic Skin Inflammation. Journal of immunology 2017; **199**:707-717.
81. RIVERA J NTAL/LAB and LAT: a balancing act in mast-cell activation and function. Trends in immunology 2005; **26**:119-22.
82. KORBER I, KATAYAMA S, EINARSDOTTIR E et al. Gene-Expression Profiling Suggests Impaired Signaling via the Interferon Pathway in Cstb-/- Microglia. PloS one 2016; **11**:e0158195.
83. WANG Z, SUN B , ZHU F Molecular characterization of glutaminyl-peptide cyclotransferase(QPCT)in Scylla paramamosain and its role in Vibrio alginolyticus and white spot syndrome virus (WSSV) infection. Fish & shellfish immunology 2018; **78**:299-309.
84. KARTBERG F, ASP L, DEJGAARD SY et al. ARFGAP2 and ARFGAP3 are essential for COPI coat assembly on the Golgi membrane of living cells. The Journal of biological chemistry 2010; **285**:36709-20.
85. SAITOH A, SHIN HW, YAMADA A et al. Three homologous ArfGAPs participate in coat protein I-mediated transport. The Journal of biological chemistry 2009; **284**:13948-57.
86. MARTINEZ A, YAMASHITA S, NAGAIKE T et al. Human BCDIN3D monomethylates cytoplasmic histidine transfer RNA. Nucleic acids research 2017; **45**:5423-5436.
87. MCKINLEY KL, SEKULIC N, GUO LY et al. The CENP-L-N Complex Forms a Critical Node in an Integrated Meshwork of Interactions at the Centromere-Kinetochore Interface. Molecular cell 2015; **60**:886-98.
88. MARJANOVIC M, SANCHEZ-HUERTAS C, TERRE B et al. CEP63 deficiency promotes p53-dependent

microcephaly and reveals a role for the centrosome in meiotic recombination. Nature communications 2015; **6**:7676.

89. LOFFLER H, FECHTER A, MATUSZEWSKA M et al. Cep63 recruits Cdk1 to the centrosome: implications for regulation of mitotic entry, centrosome amplification, and genome maintenance. Cancer research 2011; **71**:2129-39.
90. ZHAO H, ZHU L, ZHU Y et al. The Cep63 paralogue Deup1 enables massive de novo centriole biogenesis for vertebrate multiciliogenesis. Nature cell biology 2013; **15**:1434-44.
91. SZCZEPANOWSKA K, MAITI P, KUKAT A et al. CLPP coordinates mitoribosomal assembly through the regulation of ERAL1 levels. The EMBO journal 2016; **35**:2566-2583.
92. GISPERT S, PARGANLIJA D, KLINKENBERG M et al. Loss of mitochondrial peptidase Clpp leads to infertility, hearing loss plus growth retardation via accumulation of CLPX, mtDNA and inflammatory factors. Human molecular genetics 2013; **22**:4871-87.
93. LIU B, SU Y, LI T et al. CMTM7 knockdown increases tumorigenicity of human non-small cell lung cancer cells and EGFR-AKT signaling by reducing Rab5 activation. Oncotarget 2015; **6**:41092-107.
94. KAKO K, TAKEHARA A, ARAI H et al. A selective requirement for copper-dependent activation of cytochrome c oxidase by Cox17p. Biochemical and biophysical research communications 2004; **324**:1379-85.
95. ONABAJO OO, SEELEY MK, KALE A et al. Actin-binding protein 1 regulates B cell receptor-mediated antigen processing and presentation in response to B cell receptor activation. Journal of immunology 2008; **180**:6685-95.
96. CONNERT S, WIENAND S, THIEL C et al. SH3P7/mAbp1 deficiency leads to tissue and behavioral abnormalities and impaired vesicle transport. The EMBO journal 2006; **25**:1611-22.
97. YUDIN AI, TOLLNER TL, TREECE CA et al. Beta-defensin 22 is a major component of the mouse sperm glycocalyx. Reproduction 2008; **136**:753-65.
98. HA S, LINDSAY AM, TIMMS AE et al. Mutations in Dnaaf1 and Lrrc48 Cause Hydrocephalus, Laterality Defects, and Sinusitis in Mice. G3 2016; **6**:2479-87.
99. VAN ROOIJEN E, GILES RH, VOEST EE et al. LRRC50, a conserved ciliary protein implicated in polycystic kidney disease. Journal of the American Society of Nephrology : JASN 2008; **19**:1128-38.
100. PHILLIPS NJ, ZEIGLER MR , DEAVEN LL A cDNA from the ovarian cancer critical region of deletion on chromosome 17p13.3. Cancer letters 1996; **102**:85-90.
101. SEVAJOL M, REISER JB, CHOUQUET A et al. The C-terminal polyproline-containing region of ELMO contributes to an increase in the life-time of the ELMO-DOCK complex. Biochimie 2012; **94**:823-8.
102. JAWOREK TJ, RICHARD EM, IVANOVA AA et al. An alteration in ELMOD3, an Arl2 GTPase-activating protein, is associated with hearing impairment in humans. PLoS genetics 2013; **9**:e1003774.
103. TAKEMOTO N, YOSHIMURA T, MIYAZAKI S et al. Gtsf1l and Gtsf2 Are Specifically Expressed in Gonocytes and Spermatids but Are Not Essential for Spermatogenesis. PloS one 2016; **11**:e0150390.
104. CHOU TF, CHENG J, TIKH IB et al. Evidence that human histidine triad nucleotide binding protein 3 (Hint3) is a distinct branch of the histidine triad (HIT) superfamily. Journal of molecular biology 2007; **373**:978-89.
105. YOSHIKAWA K, MATSUI E, KANEKO H et al. A novel single-nucleotide substitution, Glu 4 Lys, in the leukotriene C4 synthase gene associated with allergic diseases. International journal of molecular medicine 2005; **16**:827-31.
106. HE P, LAIDLAW T, MAEKAWA A et al. Oxidative stress suppresses cysteinyl leukotriene generation by

mouse bone marrow-derived mast cells. The Journal of biological chemistry 2011; **286**:8277-86.

107. CHU J, HONG NA, MASUDA CA et al. A mouse forward genetics screen identifies LISTERIN as an E3 ubiquitin ligase involved in neurodegeneration. Proceedings of the National Academy of Sciences of the United States of America 2009; **106**:2097-103.
108. OSSAREH-NAZARI B, NINO CA, BENGTSON MH et al. Ubiquitylation by the Ltn1 E3 ligase protects 60S ribosomes from starvation-induced selective autophagy. The Journal of cell biology 2014; **204**:909-17.
109. WEBB BD, WHEELER PG, HAGEN JJ et al. Novel, compound heterozygous, single-nucleotide variants in MARS2 associated with developmental delay, poor growth, and sensorineural hearing loss. Human mutation 2015; **36**:587-92.
110. TEVES ME, JHA KN, SONG J et al. Germ cell-specific disruption of the Meig1 gene causes impaired spermiogenesis in mice. Andrology 2013; **1**:37-46.
111. LOHOFF FW, FERRARO TN, BRODKIN ES et al. Association between polymorphisms in the metallophosphoesterase (MPPE1) gene and bipolar disorder. American journal of medical genetics Part B, Neuropsychiatric genetics : the official publication of the International Society of Psychiatric Genetics 2010; **153B**:830-6.
112. KONISHI H, TASHIRO K, MURATA Y et al. CFBP is a novel tyrosine-phosphorylated protein that might function as a regulator of CIN85/CD2AP. The Journal of biological chemistry 2006; **281**:28919-31.
113. MICHIHARA A, IDE N, MIZUTANI Y et al. Involvement of microRNA214 and transcriptional regulation in reductions in mevalonate pyrophosphate decarboxylase mRNA levels in stroke-prone spontaneously hypertensive rat livers. Bioscience, biotechnology, and biochemistry 2015; **79**:1759-70.
114. LEBON S, MINAI L, CHRETIEN D et al. A novel mutation of the NDUFS7 gene leads to activation of a cryptic exon and impaired assembly of mitochondrial complex I in a patient with Leigh syndrome. Molecular genetics and metabolism 2007; **92**:104-8.
115. MONIZ LS, SURINOVA S, GHAZALY E et al. Phosphoproteomic comparison of Pik3ca and Pten signalling identifies the nucleotidase NT5C as a novel AKT substrate. Scientific reports 2017; **7**:39985.
116. HAQUE ME, ELMORE KB, TRIPATHY A et al. Properties of the C-terminal tail of human mitochondrial inner membrane protein Oxa1L and its interactions with mammalian mitochondrial ribosomes. The Journal of biological chemistry 2010; **285**:28353-62.
117. CHURCH C, GOEHRING B, FORSHA D et al. A role for Pet100p in the assembly of yeast cytochrome c oxidase: interaction with a subassembly that accumulates in a pet100 mutant. The Journal of biological chemistry 2005; **280**:1854-63.
118. BELLIZZI D, DATO S, CAVALCANTE P et al. Characterization of a bidirectional promoter shared between two human genes related to aging: SIRT3 and PSMD13. Genomics 2007; **89**:143-50.
119. HIRANO Y, HAYASHI H, IEMURA S et al. Cooperation of multiple chaperones required for the assembly of mammalian 20S proteasomes. Molecular cell 2006; **24**:977-84.
120. WANG HM, XU YF, NING SL et al. The catalytic region and PEST domain of PTPN18 distinctly regulate the HER2 phosphorylation and ubiquitination barcodes. Cell research 2014; **24**:1067-90.
121. ZHANG X, WU M, XIAO H et al. Methylation of a single intronic CpG mediates expression silencing of the PMP24 gene in prostate cancer. The Prostate 2010; **70**:765-76.
122. HAO GJ, DING YH, WEN H et al. Attenuation of deregulated miR-369-3p expression sensitizes non-small cell lung cancer cells to cisplatin via modulation of the nucleotide sugar transporter SLC35F5. Biochemical and biophysical research communications 2017; **488**:501-508.

123. FAJARDO VA, RIETZE BA, CHAMBERS PJ et al. Effects of sarcolipin deletion on skeletal muscle adaptive responses to functional overload and unload. American journal of physiology Cell physiology 2017; **313**:C154-C161.
124. LI J, ZHOU F, ZHAN D et al. A novel histone H4 arginine 3 methylation-sensitive histone H4 binding activity and transcriptional regulatory function for signal recognition particle subunits SRP68 and SRP72. The Journal of biological chemistry 2012; **287**:40641-51.
125. NAGAMINE S, TAMBA M, ISHIMINE H et al. Organ-specific sulfation patterns of heparan sulfate generated by extracellular sulfatases Sulf1 and Sulf2 in mice. The Journal of biological chemistry 2012; **287**:9579-90.
126. BERGE T, LEIKFOSS IS, BRORSON IS et al. The multiple sclerosis susceptibility genes TAGAP and IL2RA are regulated by vitamin D in CD4+ T cells. Genes and immunity 2016; **17**:118-27.
127. GODFROY O, UJI T, NAGASATO C et al. DISTAG/TBCCd1 Is Required for Basal Cell Fate Determination in Ectocarpus. The Plant cell 2017; **29**:3102-3122.
128. KANEKO KJ , DEPAMPHILIS ML TEAD4 establishes the energy homeostasis essential for blastocoel formation. Development 2013; **140**:3680-90.
129. BENHADDOU A, KEIME C, YE T et al. Transcription factor TEAD4 regulates expression of myogenin and the unfolded protein response genes during C2C12 cell differentiation. Cell death and differentiation 2012; **19**:220-31.
130. NISHIOKA N, YAMAMOTO S, KIYONARI H et al. Tead4 is required for specification of trophectoderm in pre-implantation mouse embryos. Mechanisms of development 2008; **125**:270-83.
131. YAGI R, KOHN MJ, KARAVANOVA I et al. Transcription factor TEAD4 specifies the trophectoderm lineage at the beginning of mammalian development. Development 2007; **134**:3827-36.
132. ALSTON CL, COMPTON AG, FORMOSA LE et al. Biallelic Mutations in TMEM126B Cause Severe Complex I Deficiency with a Variable Clinical Phenotype. American journal of human genetics 2016; **99**:217-27.
133. SANCHEZ-CABALLERO L, RUZZENENTE B, BIANCHI L et al. Mutations in Complex I Assembly Factor TMEM126B Result in Muscle Weakness and Isolated Complex I Deficiency. American journal of human genetics 2016; **99**:208-16.
134. SHEN DW, MA J, OKABE M et al. Elevated expression of TMEM205, a hypothetical membrane protein, is associated with cisplatin resistance. Journal of cellular physiology 2010; **225**:822-8.
135. ROSE AE, ZHAO C, TURNER EM et al. Arresting a Torsin ATPase reshapes the endoplasmic reticulum. The Journal of biological chemistry 2014; **289**:552-64.
136. BAHN E, SIEGERT S, PFANDER T et al. TorsinB expression in the developing human brain. Brain research 2006; **1116**:112-9.
137. CHUJO T , SUZUKI T Trmt61B is a methyltransferase responsible for 1-methyladenosine at position 58 of human mitochondrial tRNAs. Rna 2012; **18**:2269-76.
138. YAMAMOTO Y , SAKISAKA T Molecular machinery for insertion of tail-anchored membrane proteins into the endoplasmic reticulum membrane in mammalian cells. Molecular cell 2012; **48**:387-97.
139. NISHIZAWA Y, KONNO M, ASAI A et al. Oncogene c-Myc promotes epitranscriptome m(6)A reader YTHDF1 expression in colorectal cancer. Oncotarget 2018; **9**:7476-7486.
140. ZHAO X, CHEN Y, MAO Q et al. Overexpression of YTHDF1 is associated with poor prognosis in patients with hepatocellular carcinoma. Cancer biomarkers : section A of Disease markers 2018; **21**:859-868.
141. GONTAN C, ACHAME EM, DEMMERS J et al. RNF12 initiates X-chromosome inactivation by targeting REX1 for degradation. Nature 2012; **485**:386-90.

142. XU J, SYLVESTER R, TIGHE AP et al. Transcriptional activation of the suppressor of cytokine signaling-3 (SOCS-3) gene via STAT3 is increased in F9 REX1 (ZFP-42) knockout teratocarcinoma stem cells relative to wild-type cells. Journal of molecular biology 2008; **377**:28-46.
143. ZHAO F, ZHOU J, LI R et al. Novel function of LHFPL2 in female and male distal reproductive tract development. Scientific reports 2016; **6**:23037.
144. ZUCKER B, KAMA JA, KUHN A et al. Decreased Lin7b expression in layer 5 pyramidal neurons may contribute to impaired corticostriatal connectivity in huntington disease. Journal of neuropathology and experimental neurology 2010; **69**:880-95.
145. HORI K, KONNO D, MARUOKA H et al. MALS is a binding partner of IRSp53 at cell-cell contacts. FEBS letters 2003; **554**:30-4.
146. ENO C, SOLANKI B , PELEGRI F aura (mid1ip1l) regulates the cytoskeleton at the zebrafish egg-to-embryo transition. Development 2016; **143**:1585-99.
147. WYATT JS Cerebral oxygenation and haemodynamics in the foetus and newborn infant. Philosophical transactions of the Royal Society of London Series B, Biological sciences 1997; **352**:697-700.
148. WU Z, DERKS MFL, DIBBITS B et al. A Novel Loss-of-Function Variant in Transmembrane Protein 263 (TMEM263) of Autosomal Dwarfism in Chicken. Frontiers in genetics 2018; **9**:193.
149. SMITH BN, TICOZZI N, FALLINI C et al. Exome-wide rare variant analysis identifies TUBA4A mutations associated with familial ALS. Neuron 2014; **84**:324-31.
150. STORM MP, KUMPFMUELLER B, THOMPSON B et al. Characterization of the phosphoinositide 3-kinase-dependent transcriptome in murine embryonic stem cells: identification of novel regulators of pluripotency. Stem cells 2009; **27**:764-75.
151. NAKAI-FUTATSUGI Y , NIWA H Zscan4 Is Activated after Telomere Shortening in Mouse Embryonic Stem Cells. Stem cell reports 2016; **6**:483-495.
152. ZHANG D, ZHAO T, ANG HS et al. AMD1 is essential for ESC self-renewal and is translationally down-regulated on differentiation to neural precursor cells. Genes & development 2012; **26**:461-73.
153. NISHIMURA K, NAKATSU F, KASHIWAGI K et al. Essential role of S-adenosylmethionine decarboxylase in mouse embryonic development. Genes to cells : devoted to molecular & cellular mechanisms 2002; **7**:41-7.
154. MROCZEK S, CHLEBOWSKA J, KULINSKI TM et al. The non-canonical poly(A) polymerase FAM46C acts as an onco-suppressor in multiple myeloma. Nature communications 2017; **8**:619.
155. ZHU YX, SHI CX, BRUINS LA et al. Loss of FAM46C Promotes Cell Survival in Myeloma. Cancer research 2017; **77**:4317-4327.
156. ELABD C, COUSIN W, UPADHYAYULA P et al. Oxytocin is an age-specific circulating hormone that is necessary for muscle maintenance and regeneration. Nature communications 2014; **5**:4082.
157. LIN YT, CHEN CC, HUANG CC et al. Oxytocin stimulates hippocampal neurogenesis via oxytocin receptor expressed in CA3 pyramidal neurons. Nature communications 2017; **8**:537.
158. GUPTA P, SOYOMBO AA, SHELTON JM et al. Disruption of PPT2 in mice causes an unusual lysosomal storage disorder with neurovisceral features. Proceedings of the National Academy of Sciences of the United States of America 2003; **100**:12325-30.
159. HARRISON FE, YU SS, VAN DEN BOSSCHE KL et al. Elevated oxidative stress and sensorimotor deficits but normal cognition in mice that cannot synthesize ascorbic acid. Journal of neurochemistry 2008; **106**:1198-208.
160. CAO Z, FANG Y, LU Y et al. Melatonin alleviates cadmium-induced liver injury by inhibiting the TXNIP-

NLRP3 inflammasome. Journal of pineal research 2017; **62**.

161. LI J, YUE Z, XIONG W et al. TXNIP overexpression suppresses proliferation and induces apoptosis in SMMC7221 cells through ROS generation and MAPK pathway activation. Oncology reports 2017; **37**:3369-3376.
162. HOOG JO , OSTBERG LJ Mammalian alcohol dehydrogenases--a comparative investigation at gene and protein levels. Chemico-biological interactions 2011; **191**:2-7.
163. POON HF, FRASIER M, SHREVE N et al. Mitochondrial associated metabolic proteins are selectively oxidized in A30P alpha-synuclein transgenic mice--a model of familial Parkinson's disease. Neurobiology of disease 2005; **18**:492-8.
164. XIAO Y, LIU J, PENG Y et al. GSTA3 Attenuates Renal Interstitial Fibrosis by Inhibiting TGF-Beta-Induced Tubular Epithelial-Mesenchymal Transition and Fibronectin Expression. PloS one 2016; **11**:e0160855.
165. MENG L, RIJNTJES E, SWARTS H et al. Dietary-Induced Chronic Hypothyroidism Negatively Affects Rat Follicular Development and Ovulation Rate and Is Associated with Oxidative Stress. Biology of reproduction 2016; **94**:90.
166. HAYES JD , PULFORD DJ The glutathione S-transferase supergene family: regulation of GST and the contribution of the isoenzymes to cancer chemoprotection and drug resistance. Critical reviews in biochemistry and molecular biology 1995; **30**:445-600.
167. FLOGEL U, GODECKE A, KLOTZ LO et al. Role of myoglobin in the antioxidant defense of the heart. FASEB journal : official publication of the Federation of American Societies for Experimental Biology 2004; **18**:1156-8.
168. TUNSTER SJ, CREETH HDJ , JOHN RM The imprinted Phlda2 gene modulates a major endocrine compartment of the placenta to regulate placental demands for maternal resources. Developmental biology 2016; **409**:251-260.
169. JIN F, QIAO C, LUAN N et al. Lentivirus-mediated PHLDA2 overexpression inhibits trophoblast proliferation, migration and invasion, and induces apoptosis. International journal of molecular medicine 2016; **37**:949-57.
170. YU J, LU Y, LI Y et al. Role of S100A1 in hypoxia-induced inflammatory response in cardiomyocytes via TLR4/ROS/NF-kappaB pathway. The Journal of pharmacy and pharmacology 2015; **67**:1240-50.
171. SAKAMOTO A , SUGAMOTO Y Identification of a novel aldose reductase-like gene upregulated in the failing heart of cardiomyopathic hamster. Molecular and cellular biochemistry 2011; **353**:275-81.
172. XIONG W, QIU SY, XU LY et al. Effects of intermedin on dorsal root ganglia in the transmission of neuropathic pain in chronic constriction injury rats. Clinical and experimental pharmacology & physiology 2015; **42**:780-7.
173. KOLTAI T Clusterin: a key player in cancer chemoresistance and its inhibition. OncoTargets and therapy 2014; **7**:447-56.
174. SANSANWAL P, LI L , SARWAL MM Inhibition of intracellular clusterin attenuates cell death in nephropathic cystinosis. Journal of the American Society of Nephrology : JASN 2015; **26**:612-25.
175. LIN CC, TSAI P, SUN HY et al. Apolipoprotein J, a glucose-upregulated molecular chaperone, stabilizes core and NS5A to promote infectious hepatitis C virus virion production. Journal of hepatology 2014; **61**:984-93.
176. UTHEIM TP, SALVANOS P, UTHEIM OA et al. Transcriptome Analysis of Cultured Limbal Epithelial Cells on an Intact Amniotic Membrane following Hypothermic Storage in Optisol-GS. Journal of functional

biomaterials 2016; **7**.
177. ANTOGNELLI C, PALUMBO I, ARISTEI C et al. Glyoxalase I inhibition induces apoptosis in irradiated MCF-7 cells via a novel mechanism involving Hsp27, p53 and NF-kappaB. British journal of cancer 2014; **111**:395-406.
178. SARTO C, BINZ PA , MOCARELLI P Heat shock proteins in human cancer. Electrophoresis 2000; **21**:1218-26.
179. PARCELLIER A, SCHMITT E, GURBUXANI S et al. HSP27 is a ubiquitin-binding protein involved in I-kappaBalpha proteasomal degradation. Molecular and cellular biology 2003; **23**:5790-802.
180. HERDER C, DE LAS HERAS GALA T, CARSTENSEN-KIRBERG M et al. Circulating Levels of Interleukin 1-Receptor Antagonist and Risk of Cardiovascular Disease: Meta-Analysis of Six Population-Based Cohorts. Arteriosclerosis, thrombosis, and vascular biology 2017; **37**:1222-1227.
181. ZAND B, PREVIS RA, ZACHARIAS NM et al. Role of Increased n-acetylaspartate Levels in Cancer. Journal of the National Cancer Institute 2016; **108**:djv426.
182. WANG Z, CAO CJ, HUANG LL et al. EFEMP1 promotes the migration and invasion of osteosarcoma via MMP-2 with induction by AEG-1 via NF-kappaB signaling pathway. Oncotarget 2015; **6**:14191-208.
183. YAN L, LI Q, YANG J et al. TPX2-p53-GLIPR1 regulatory circuitry in cell proliferation, invasion, and tumor growth of bladder cancer. Journal of cellular biochemistry 2018; **119**:1791-1803.
184. WU MM, LI CF, LIN LF et al. Promoter hypermethylation of LGALS4 correlates with poor prognosis in patients with urothelial carcinoma. Oncotarget 2017; **8**:23787-23802.
185. ARIKAWA T, SIMAMURA E, SHIMADA H et al. Expression pattern of Galectin 4 in rat placentation. Placenta 2012; **33**:885-7.
186. MUTO M, FUJIHARA Y, TOBITA T et al. Lentiviral Vector-Mediated Complementation Restored Fetal Viability but Not Placental Hyperplasia in Plac1-Deficient Mice. Biology of reproduction 2016; **94**:6.
187. YANG X, LI Y, LI L et al. SnoRNAs are involved in the progression of ulcerative colitis and colorectal cancer. Digestive and liver disease : official journal of the Italian Society of Gastroenterology and the Italian Association for the Study of the Liver 2017; **49**:545-551.
188. YOSHIDA K, TODEN S, WENG W et al. SNORA21 - An Oncogenic Small Nucleolar RNA, with a Prognostic Biomarker Potential in Human Colorectal Cancer. EBioMedicine 2017; **22**:68-77.
189. PAN YZ, ZHOU A, HU Z et al. Small nucleolar RNA-derived microRNA hsa-miR-1291 modulates cellular drug disposition through direct targeting of ABC transporter ABCC1. Drug metabolism and disposition: the biological fate of chemicals 2013; **41**:1744-51.
190. PERRETTI M , D'ACQUISTO F Annexin A1 and glucocorticoids as effectors of the resolution of inflammation. Nature reviews Immunology 2009; **9**:62-70.
191. ZHANG Q, RAHIM MM, ALLAN DS et al. Mouse Nkrp1-Clr gene cluster sequence and expression analyses reveal conservation of tissue-specific MHC-independent immunosurveillance. PloS one 2012; **7**:e50561.
192. PARK OH, PARK J, YU M et al. Identification and molecular characterization of cellular factors required for glucocorticoid receptor-mediated mRNA decay. Genes & development 2016; **30**:2093-2105.
193. MATSUMOTO M, KANOUCHI H, SUZUKI K et al. Purification and characterization of perchloric acid soluble protein from rat lung. Comparative biochemistry and physiology Part B, Biochemistry & molecular biology 2003; **135**:255-62.
194. MANTUANO E, AZMOON P, BRIFAULT C et al. Tissue-type plasminogen activator regulates macrophage activation and innate immunity. Blood 2017; **130**:1364-1374.
195. MICHAEL JV, WURTZEL JGT, MAO GF et al. Platelet microparticles infiltrating solid tumors transfer miRNAs

that suppress tumor growth. Blood 2017; **130**:567-580.
196. WANDERNOTH PM, MANNOWETZ N, SZCZYRBA J et al. Normal Fertility Requires the Expression of Carbonic Anhydrases II and IV in Sperm. The Journal of biological chemistry 2015; **290**:29202-16.
197. ZHANG X, WEISSMAN SM , NEWBURGER PE Long intergenic non-coding RNA HOTAIRM1 regulates cell cycle progression during myeloid maturation in NB4 human promyelocytic leukemia cells. RNA biology 2014; **11**:777-87.
198. SCHLAKE T , BOEHM T Expression domains in the skin of genes affected by the nude mutation and identified by gene expression profiling. Mechanisms of development 2001; **109**:419-22.
199. BERLETCH JB, DENG X, NGUYEN DK et al. Female bias in Rhox6 and 9 regulation by the histone demethylase KDM6A. PLoS genetics 2013; **9**:e1003489.
200. JANER A, ANTONICKA H, LALONDE E et al. An RMND1 Mutation causes encephalopathy associated with multiple oxidative phosphorylation complex deficiencies and a mitochondrial translation defect. American journal of human genetics 2012; **91**:737-43.
201. MOUTA CARREIRA C, LAVALLEE TM, TARANTINI F et al. S100A13 is involved in the regulation of fibroblast growth factor-1 and p40 synaptotagmin-1 release in vitro. The Journal of biological chemistry 1998; **273**:22224-31.
202. STURCHLER E, COX JA, DURUSSEL I et al. S100A16, a novel calcium-binding protein of the EF-hand superfamily. The Journal of biological chemistry 2006; **281**:38905-17.
203. WILSON JA, PROW NA, SCHRODER WA et al. RNA-Seq analysis of chikungunya virus infection and identification of granzyme A as a major promoter of arthritic inflammation. PLoS pathogens 2017; **13**:e1006155.
204. FALCO G, LEE SL, STANGHELLINI I et al. Zscan4: a novel gene expressed exclusively in late 2-cell embryos and embryonic stem cells. Developmental biology 2007; **307**:539-50.
205. STORM MP, KUMPFMUELLER B, BONE HK et al. Zscan4 is regulated by PI3-kinase and DNA-damaging agents and directly interacts with the transcriptional repressors LSD1 and CtBP2 in mouse embryonic stem cells. PloS one 2014; **9**:e89821.
206. ZALZMAN M, FALCO G, SHAROVA LV et al. Zscan4 regulates telomere elongation and genomic stability in ES cells. Nature 2010; **464**:858-63.