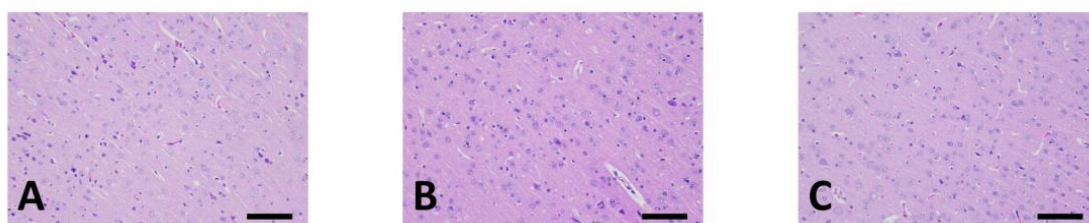
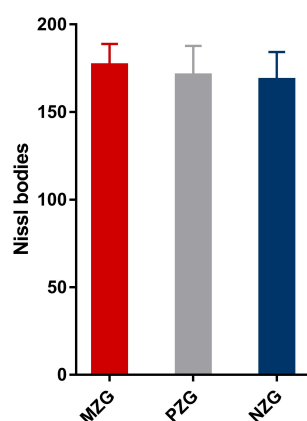


Supplementary figures



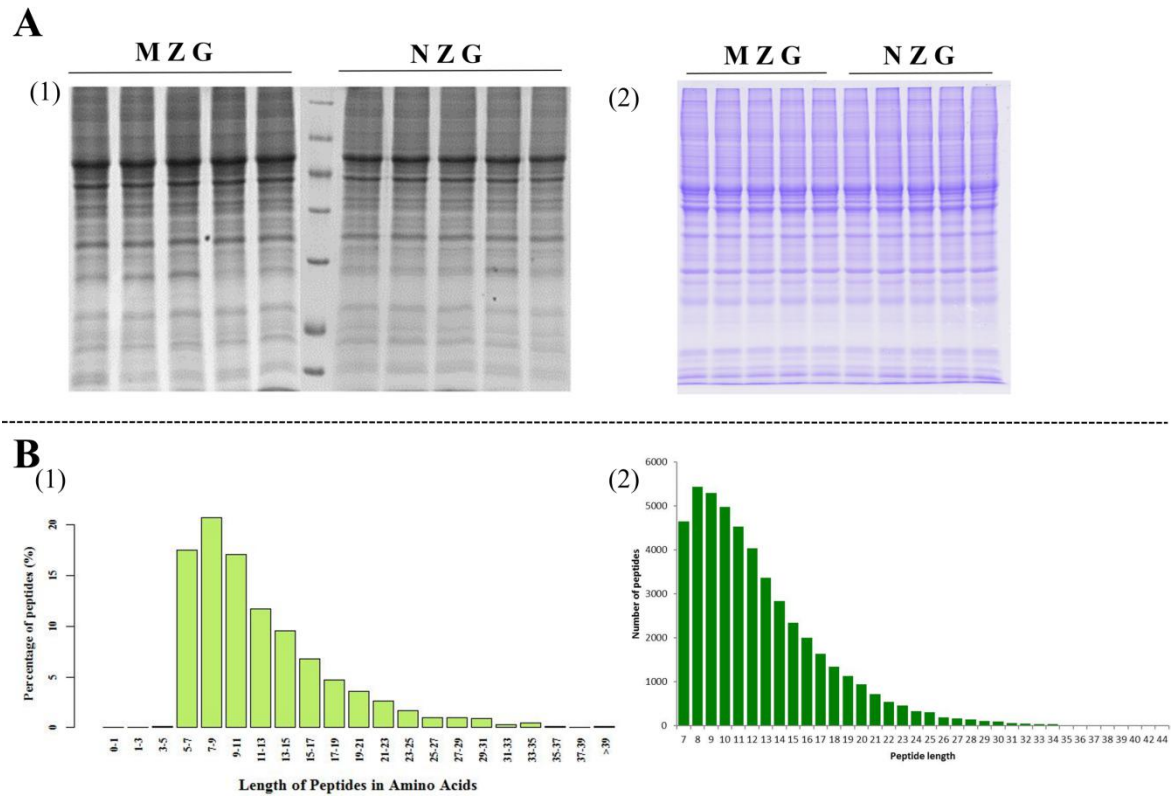
Supplemental figure-1 Results of HE staining in the second animal experiment
($\times 200$, $X=100\text{ }\mu\text{m}$).

A: Marginal zinc-deficient group (MZG), B: Normal zinc group (NZG), C: Paired zinc group (PZG).



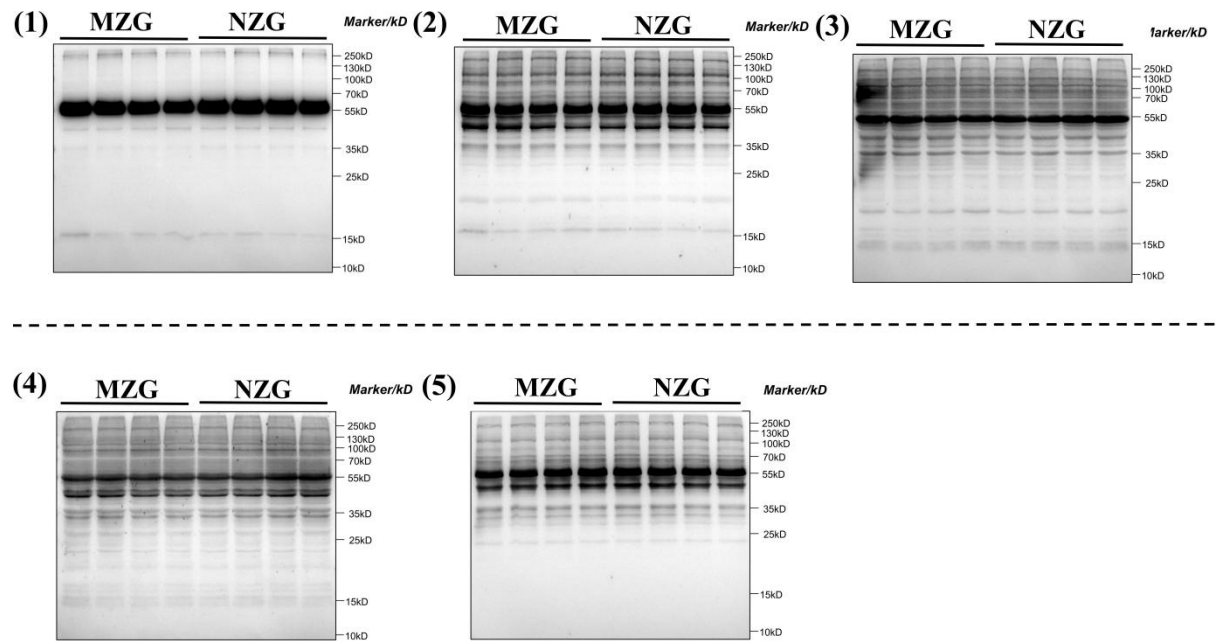
Supplemental figure-2 Quantitative analysis results of the Nissl staining.

MZG: Marginal zinc-deficient group, PZG: Paired zinc group, NZG: Normal zinc group.



Supplemental figure-3 Quality control validation of protein extraction and MS data.

A: quality control of protein extraction (SDS-PAGE of coomassie brilliant blue staining), B: mass spectrometry data validation (peptide length distribution); (1) hippocampal proteomics analysis after 4 weeks of feeding with the low zinc diet. (2) hippocampal proteomics analysis after 8 weeks of feeding with the low zinc diet.



Supplemental figure-4 Acetylation, crotonylation, 2-hydroxyisobutyrylation, succinylation and malonylation of whole proteins in hippocampus between MZG and NZG.

(1) acetylation (2) crotonylation (3) 2-hydroxyisobutyrylation (4) succinylation (5) malonylation

Supplemental table-1 Significant differential proteins with the fold change greater than 1.2 in hippocampus after 4 weeks feeding of low zinc diet.

Uniprot Accession	Protein Name	Fold Change (MZG/NZG)	P-value
A0A0G2K0W1	Disabled homolog 1	0.4950	0.0000
Q5SGE0	Leucine-rich PPR motif-containing protein, mitochondrial	0.6298	0.0146
P15087	Carboxypeptidase E	0.6469	0.0094
A0A0G2JUP3	Obscurin, cytoskeletal calmodulin and titin-interacting RhoGEF	0.6481	0.0005
Q9ESM0	Inositol hexakisphosphate kinase 1	0.6619	0.0001
A0A0G2JSH5	Serum albumin	0.6718	0.0175
D3ZU48	Uncharacterized protein	0.7238	0.0010
Q9QX79	Fetuin-B	0.7250	0.0009
Q6QI89	Mortality factor 4-like protein 2	0.7686	0.0001
I7EFB0	Myelin basic protein transcript variant N (Fragment)	0.7903	0.0463
F1M7S3	Proenkephalin-B	0.8124	0.0214
G3V9J8	Glycerol-3-phosphate acyltransferase 1, mitochondrial	0.8249	0.0163
G3V9K8	Developmentally regulated RNA-binding protein 1	0.8263	0.0042
A0A0G2K926	Alpha-1-inhibitor III	0.8268	0.0133
D4A701	Methyltransferase-like 14	0.8278	0.0041
F1LXS5	REST corepressor 1	1.2152	0.0001
Q6AYT0	Quinone oxidoreductase	1.2621	0.0445
F1LM33	Leucine-rich PPR motif-containing protein, mitochondrial	1.6165	0.0085
Q5U322	Carboxypeptidase E	1.7125	0.017
A0A0G2K5J5	Netrin G2	2.21	0.0139

Supplemental table-2 Significant differential proteins with the fold change greater than 1.2 in hippocampus after 8 weeks feeding of low zinc diet.

Uniprot Accession	Protein Name	Fold Change(MZG/NZG)	P-value
M0R3J7	Sterile alpha motif domain-containing 12	0.8180	0.0064
D3ZTN5	Ring finger protein, transmembrane 2	0.8150	0.0375
Q5M860	Rho GDP dissociation inhibitor beta	0.8090	0.0050
D3ZG37	Protein phosphatase 6, regulatory subunit 1	0.8040	0.0387
Q66HD2	Kelch-like protein 36	0.7970	0.0099
A0A0G2JTL7	RBR-type E3 ubiquitin transferase	0.7890	0.0499
D3ZXD2	ATP-binding cassette, subfamily A (ABC1), member 8a	0.7700	0.0008
A0A0G2JZ56	Ankyrin 2	0.7530	0.0039
Q5FVJ7	Intraflagellar transport protein 22 homolog	0.7480	0.0085
Q64654	Lanosterol 14-alpha demethylase	0.7300	0.0362
Q5HZA7	Bin1 protein	0.7130	0.0257
D3ZXL9	Potassium channel tetramerization domain-containing 4	0.6970	0.0026
P07808	Pro-neuropeptide Y	0.6920	0.0006
A0A0G2K5V4	Uncharacterized protein	0.6900	0.0000
A0A0G2JXV1	Coiled-coil domain-containing 196	0.6470	0.0003
O08769	Cyclin dependent kinase inhibitor	0.6430	0.0000
D3ZMR1	Translocase of outer mitochondrial membrane 7	0.608	0.039
D4ACS0	Protein phosphatase 1 regulatory subunit 12A	1.224	0.0426
A0A096MJE3	G1 to S phase transition 2	1.234	0.0185
P60825	Cold-inducible RNA-binding protein	1.251	0.0353
P59382	Peroxisomal membrane protein 4	1.26	0.0187
Q497B0	Omega-amidase NIT2	1.262	0.0085
D4AAT1	ADAM metallopeptidase with thrombospondin type 1 motif, 8	1.476	0.0156
P01048	T-kininogen 1	2.215	0.0132