Bazi Bushen capsule restores fertility by targeting mitochondrial function in aging endometrium

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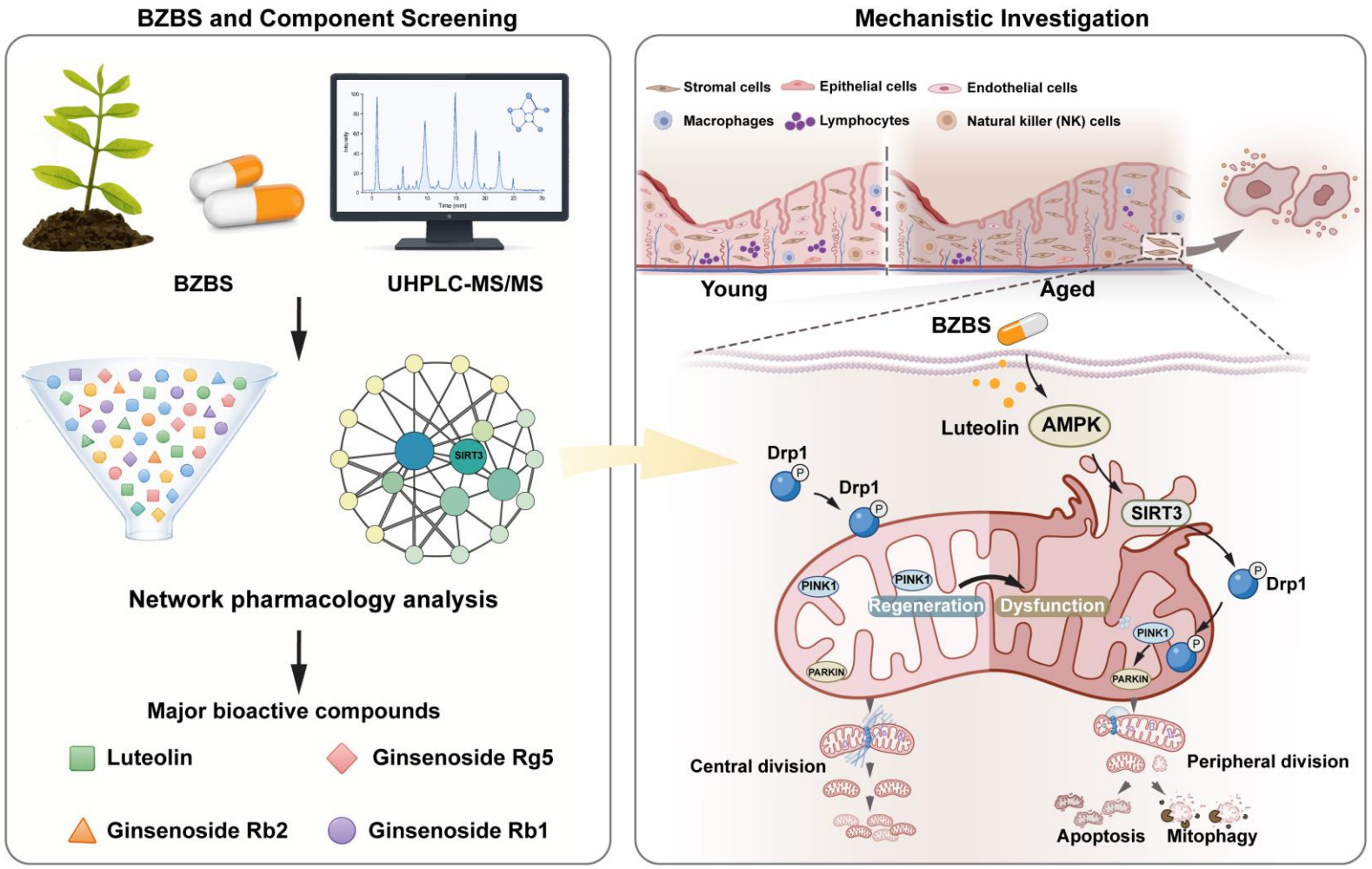
Shangqi Li, Feng Deng, Hongjuan Niu, Meng Li, Zeyang Lin, Jiayi Ma, Yue Wang, et al. 2026. Bazi Bushen capsule restores fertility by targeting mitochondrial function in aging endometrium. ***iMeta*** 5: e70154.
https://doi.org/10.1002/imt2.70154

Highlights



- First evidence establishes Bazi Bushen Capsule as an effective intervention for endometrial aging.
- Bioactive components driving its therapeutic effects are systematically characterized.
- Targeting mitochondrial homeostasis emerges as a mechanistic basis for its anti-aging effects and a framework for traditional medicine modernization.

BZBS alleviates endometrial senescence and improves uterine function in aged mice

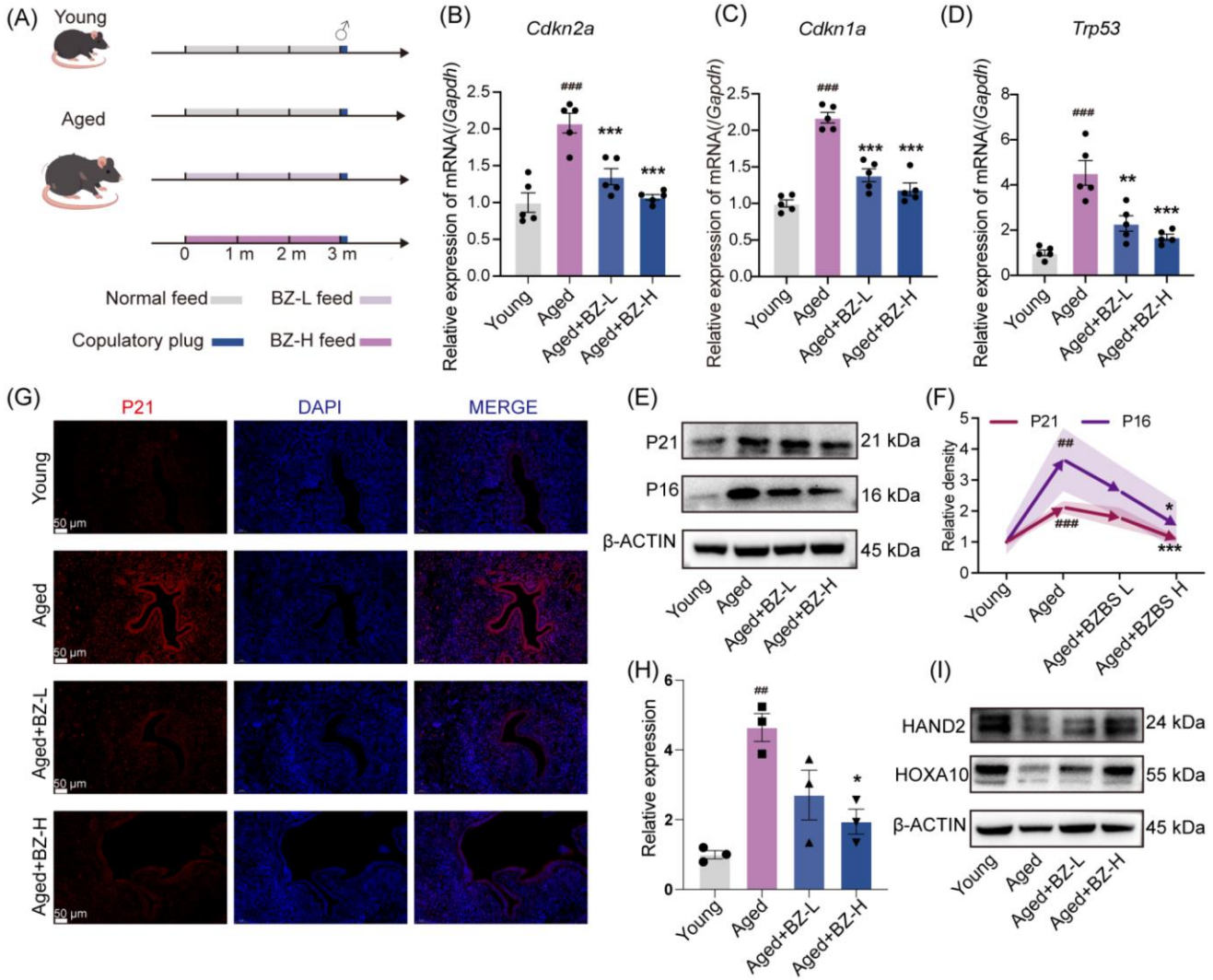


Figure 1. BZBS Ameliorates Endometrial Aging and Improves Endometrial Function and Implantation Capacity in Aged Mice.

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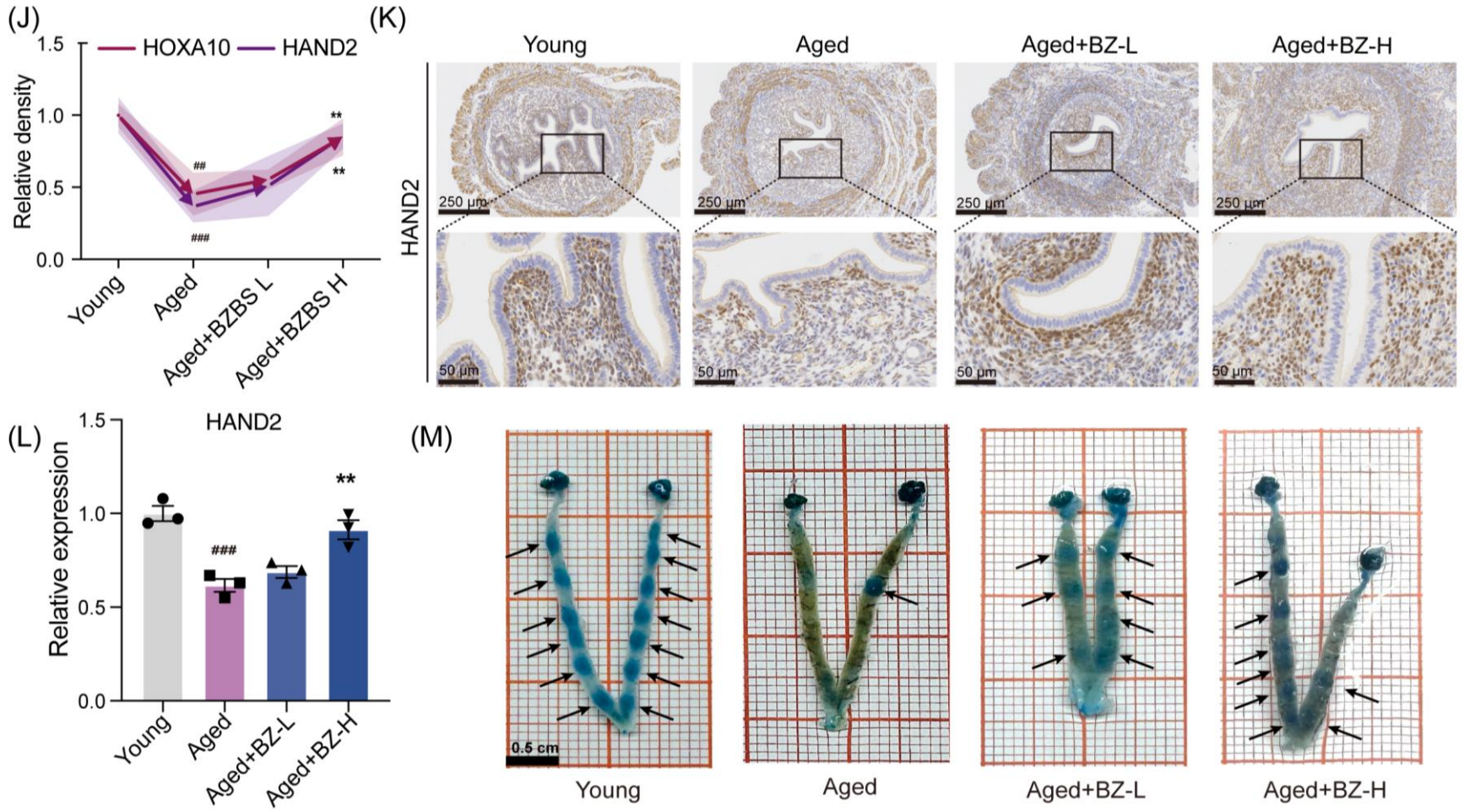

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BZBS reverses cellular senescence and restores decidualization capacity in HESCs

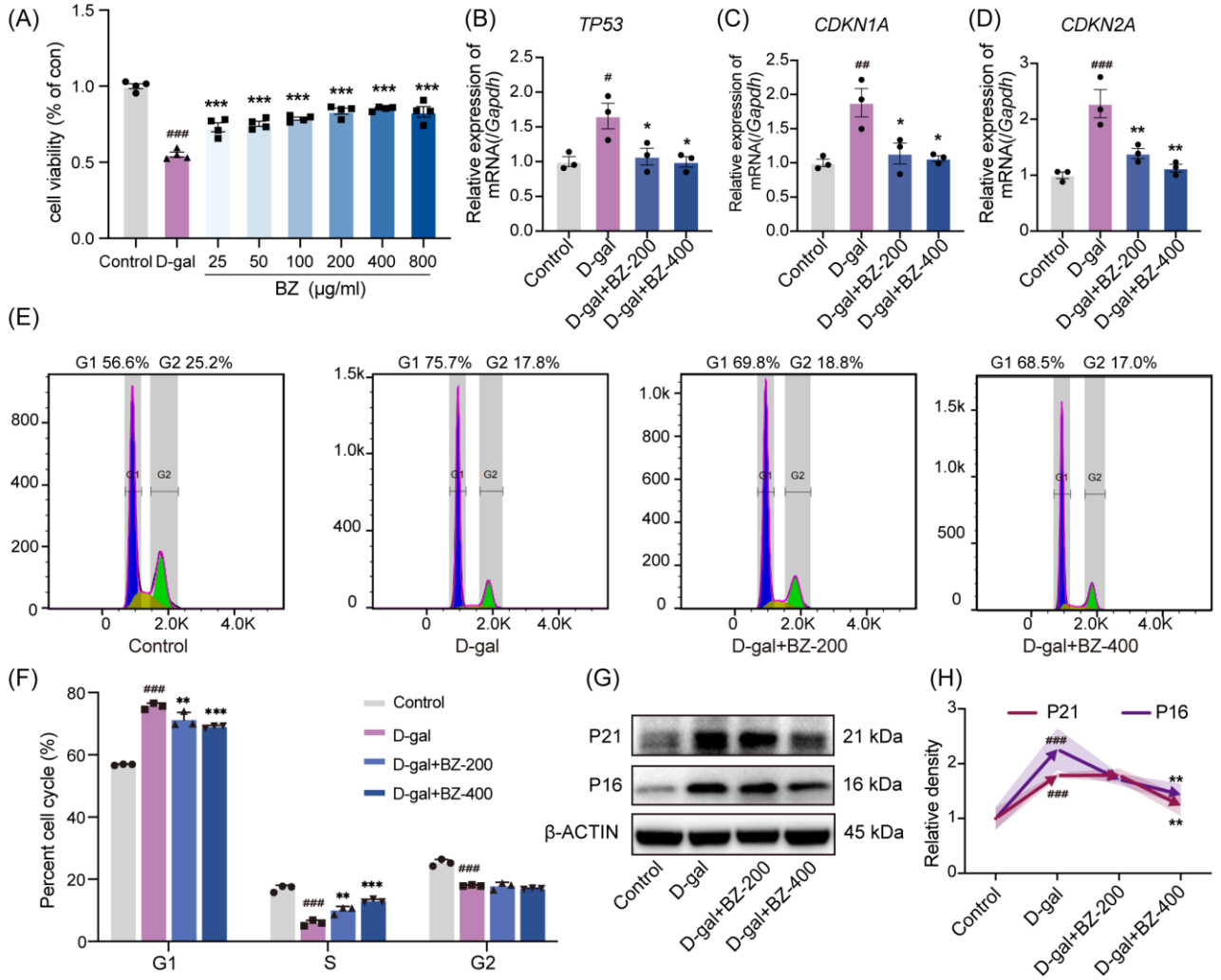

Figure 2. BZBS Attenuates D-galactose-Induced Senescence and Restores Decidualization Capacity in Human Endometrial Stromal Cells.

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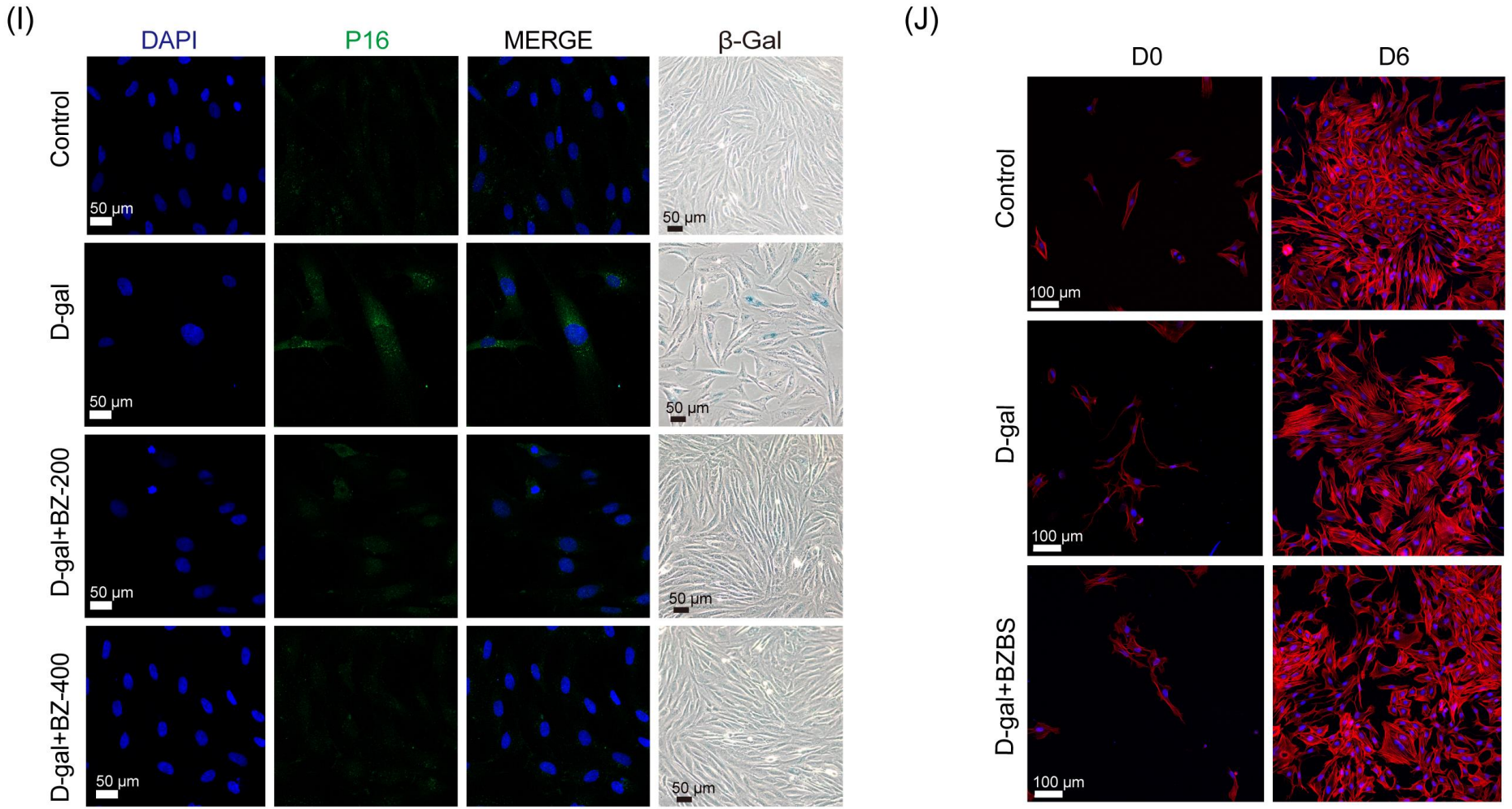

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BZBS regulates aging-related targets and transcriptomic pathways related to energy metabolism

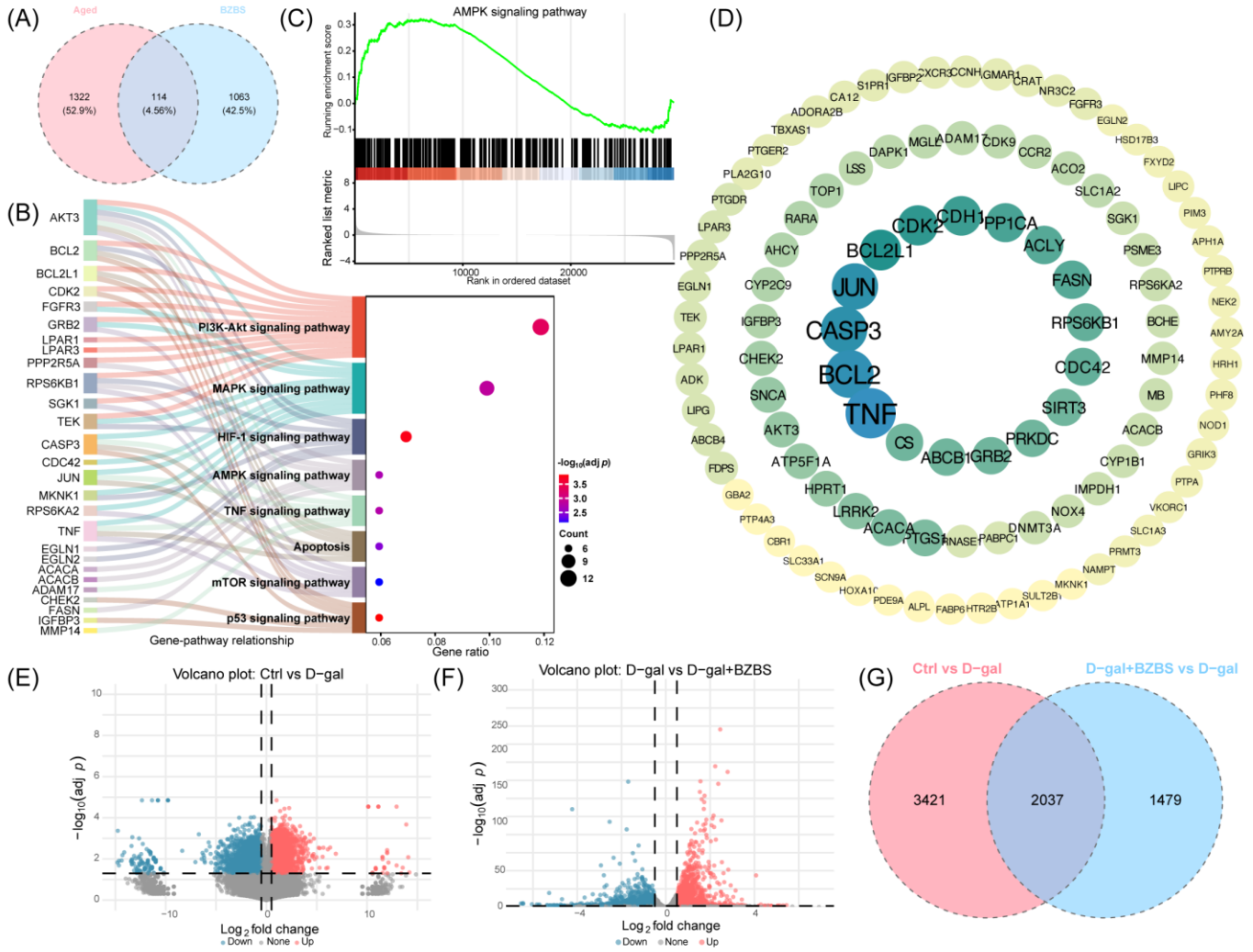

Figure 3. Integrated Network Pharmacology and Transcriptomic Analyses Reveal Potential Mechanisms of BZBS Against Endometrial Aging.

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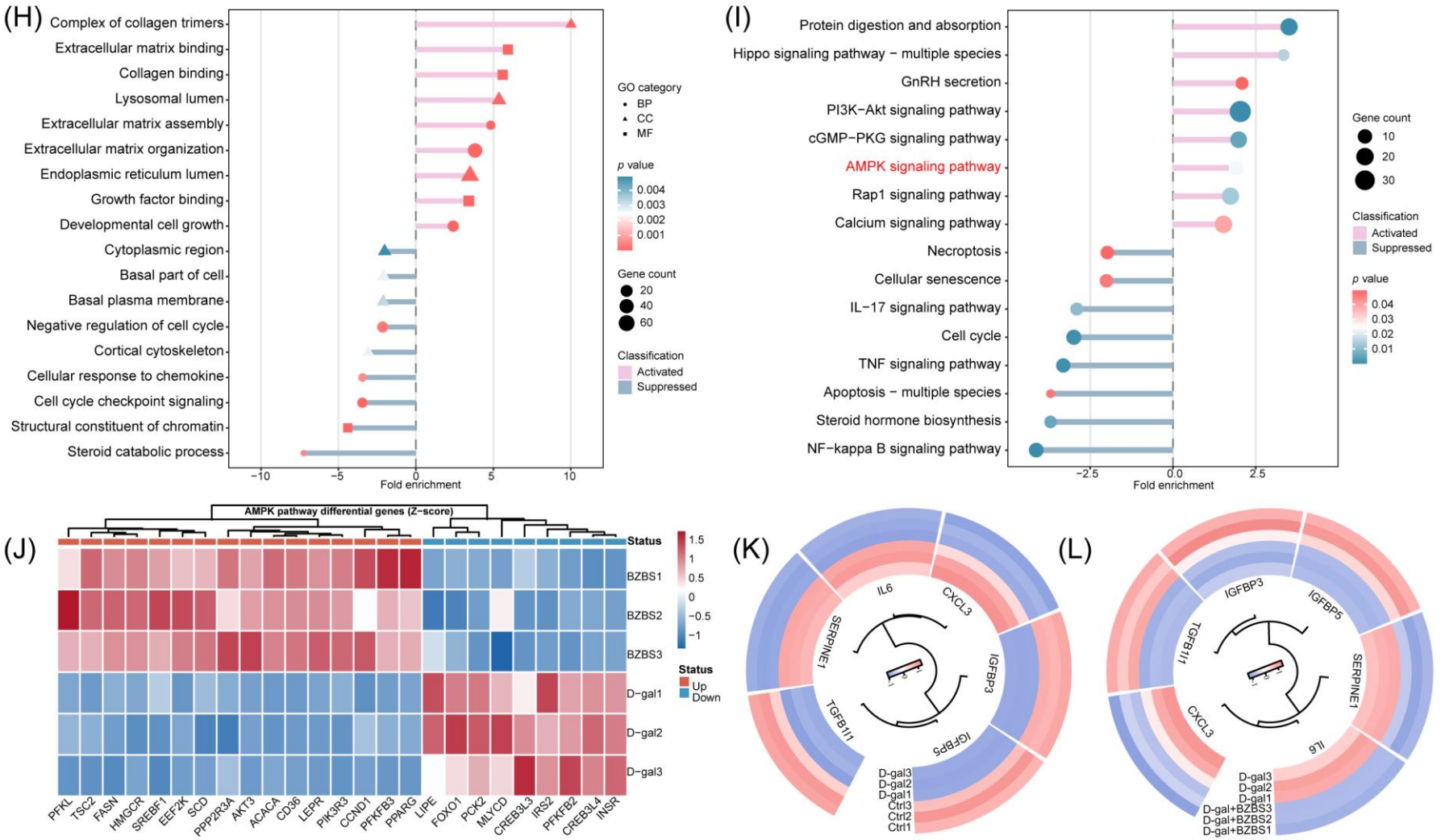

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BZBS activates AMPK signaling and regulates SIRT3 expression

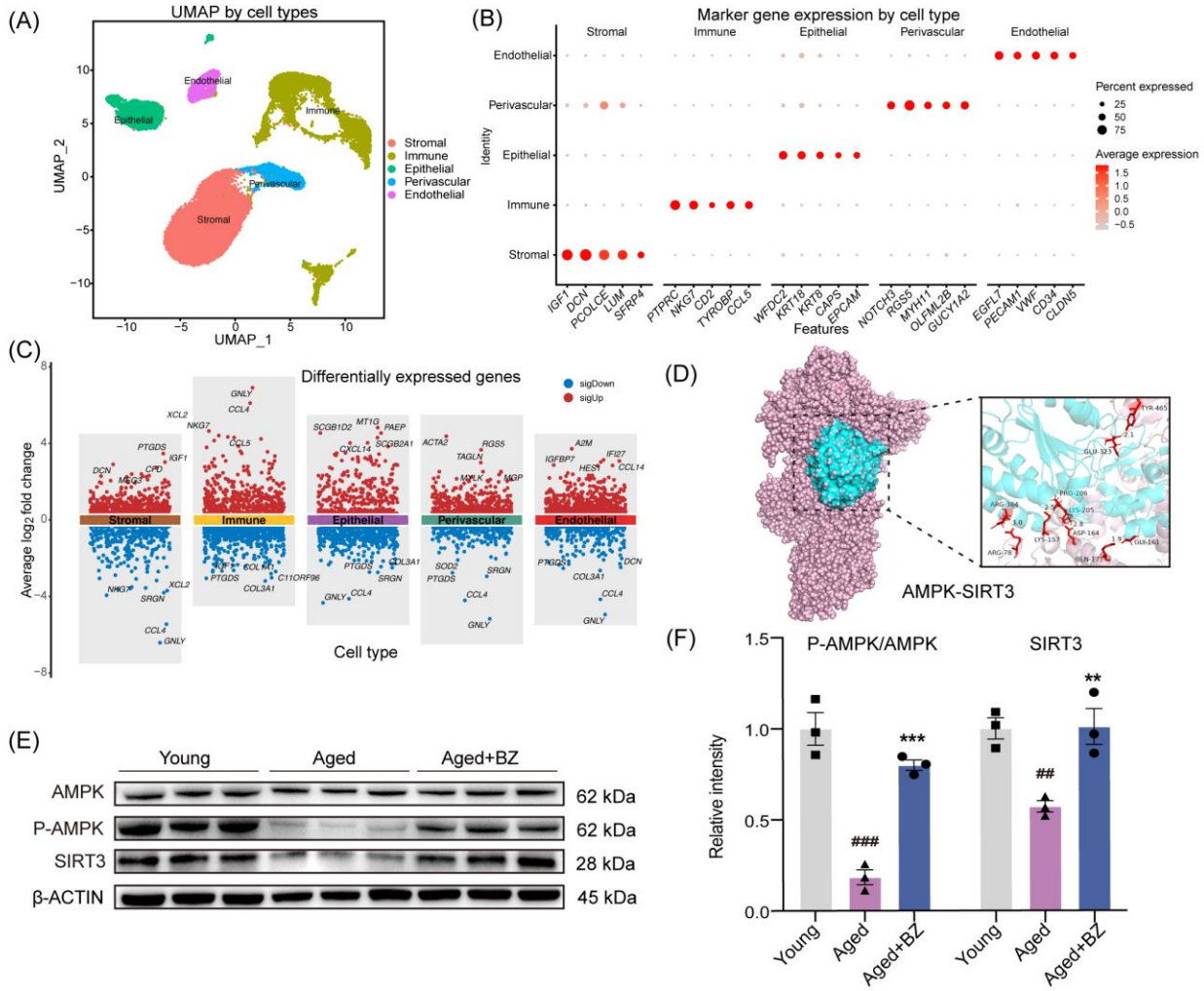

Figure 4. Single-cell transcriptomic profiling and functional validation of BZBS-mediated anti-endometrial aging effects.

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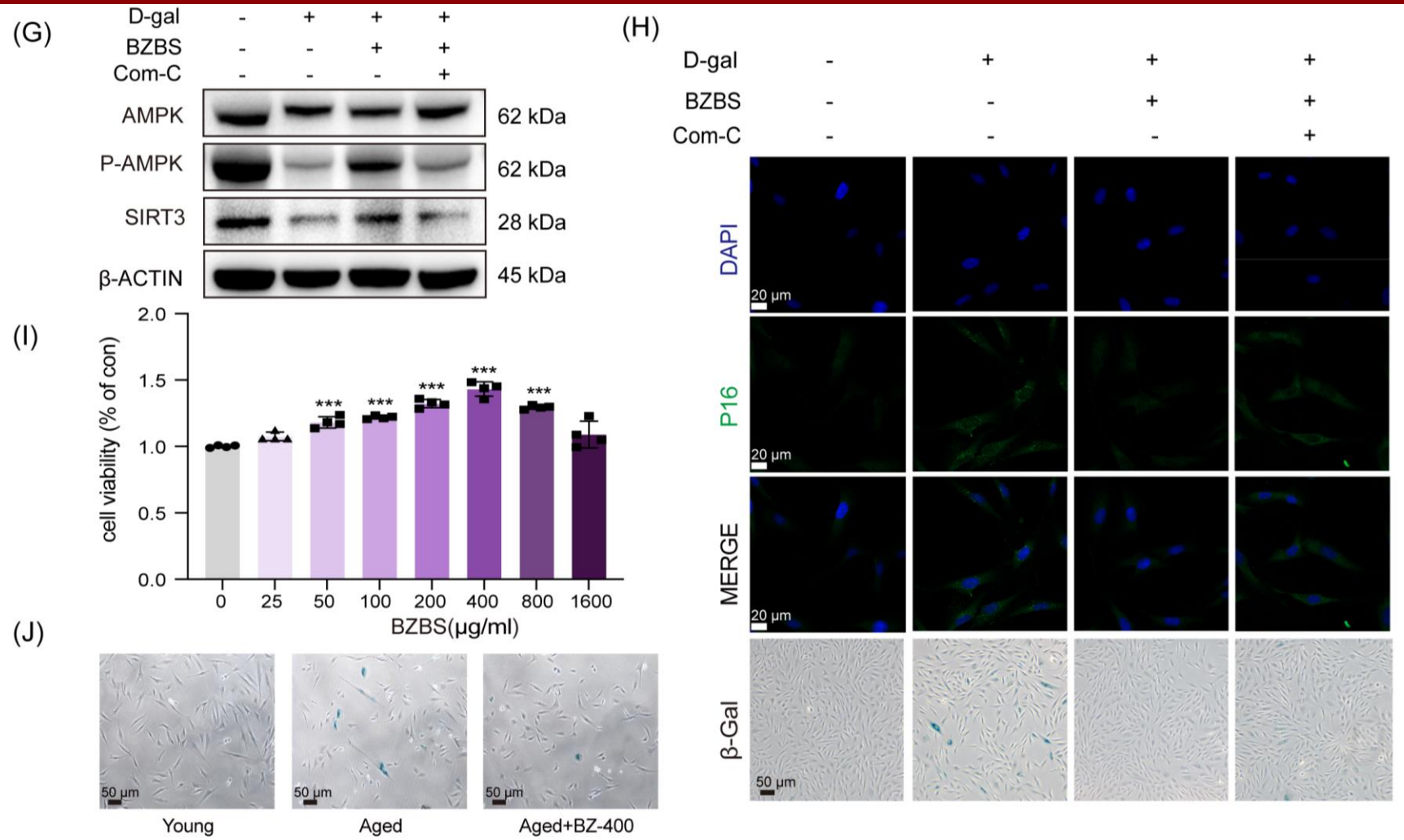

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Elucidation of the key anti-senescence components in BZBS

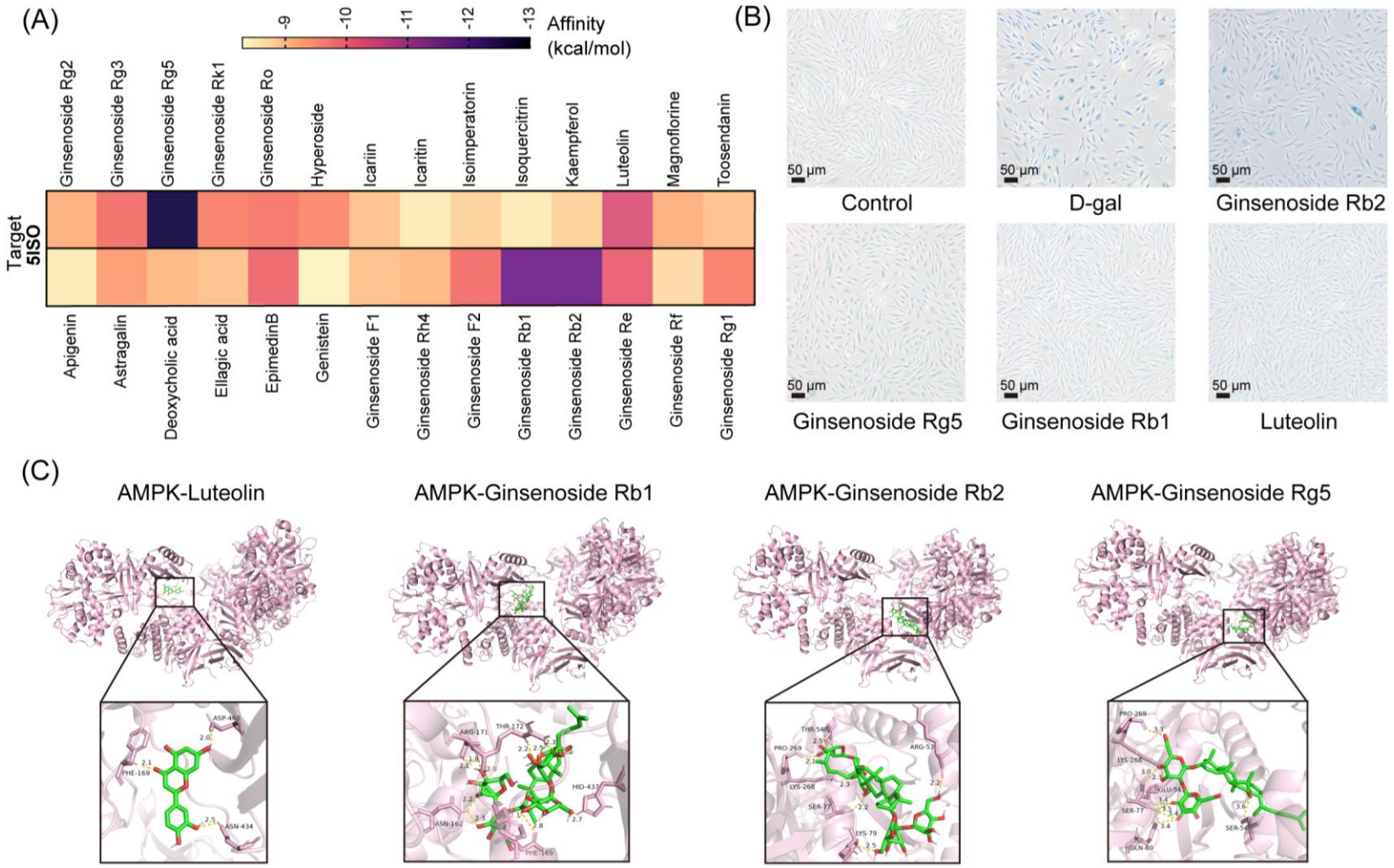

Figure 5. Molecular docking and dynamics simulation validation of binding interactions between core bioactive components of BZBS and target proteins.

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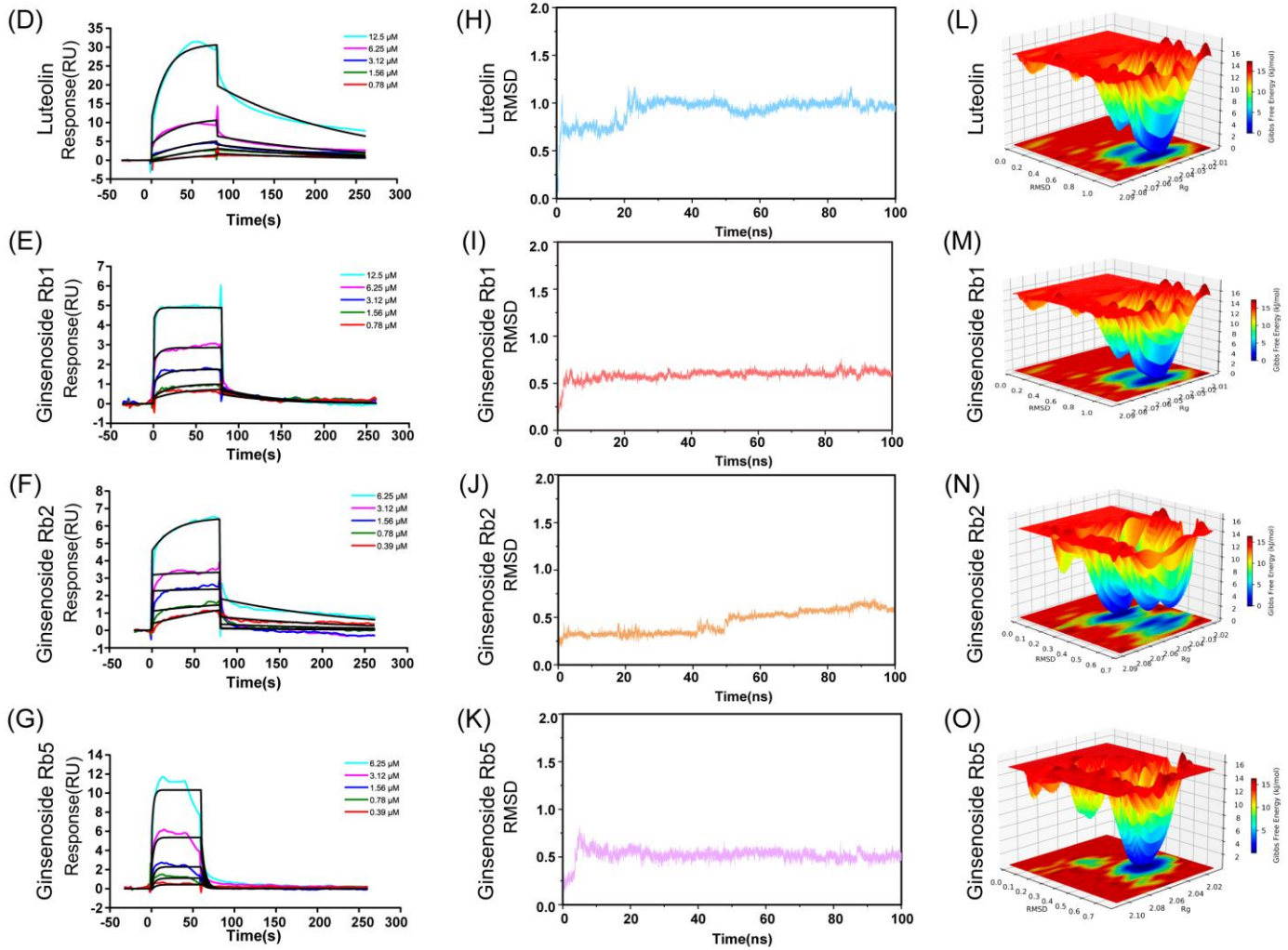

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Luteolin ameliorated aging-associated endometrial damage and improved mitochondrial homeostasis via AMPK–SIRT3

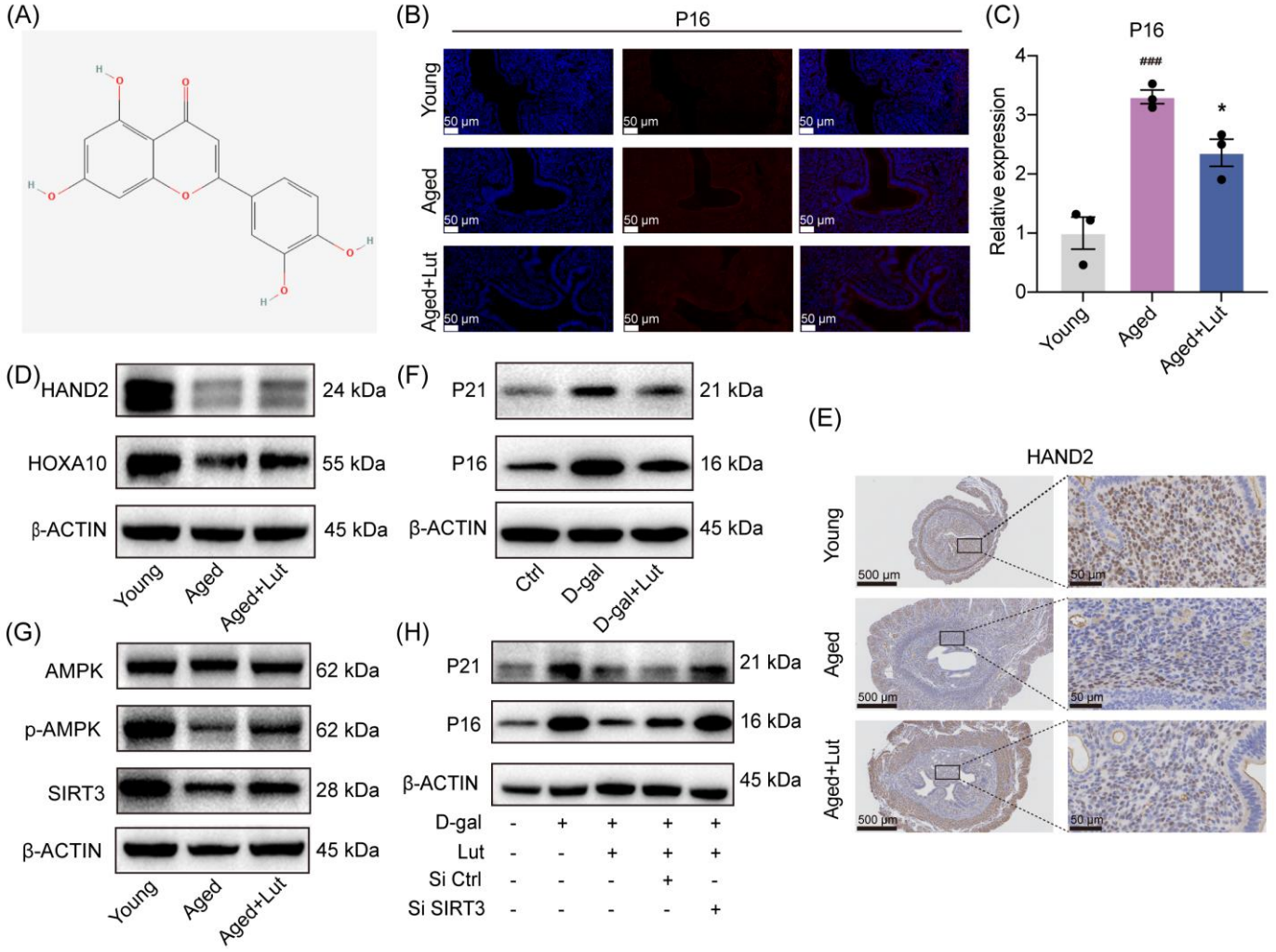

Figure 6. Luteolin alleviates endometrial senescence and restores mitochondrial homeostasis via the AMPK–SIRT3 axis.

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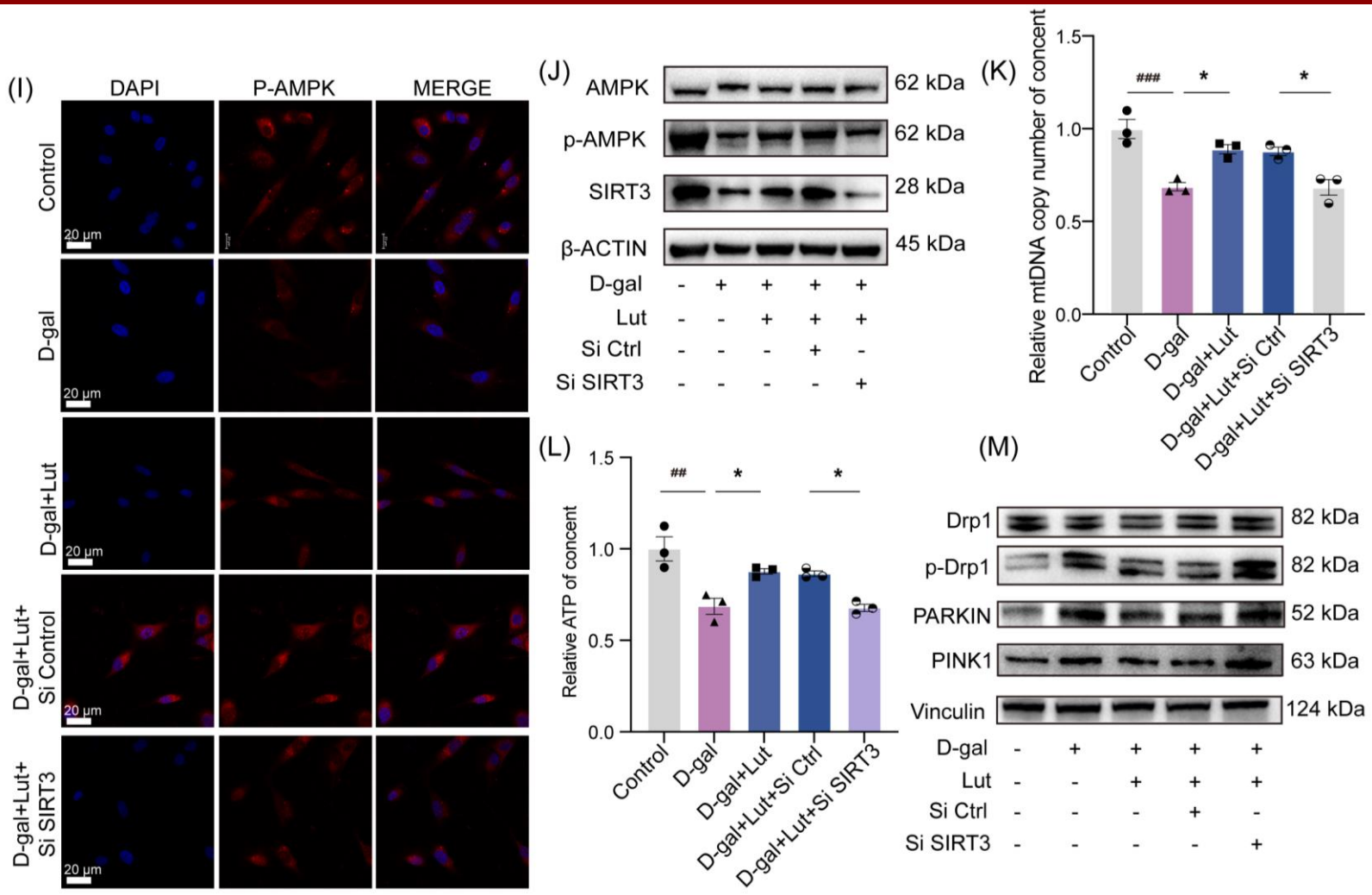

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Summary

In conclusion, this study systematically elucidated the novel mechanism by which BZBS ameliorated age-related defects in endometrial receptivity and identifies ginsenosides Rb1, Rb2, Rg5, and luteolin as its core bioactive components. We indicated that BZBS and its active constituents function by activating the AMPK–SIRT3 signaling pathway to regulate PARKIN/PINK1–mediated mitophagy and restore mitochondrial homeostasis. This cascade effectively alleviated endometrial senescence and enhanced endometrial receptivity, thereby boosting embryo implantation potential. These findings not only provided a scientific basis for the application of BZBS in the treatment of age-related infertility but also highlighted a promising therapeutic strategy for supporting reproductive health in women of advanced maternal age.

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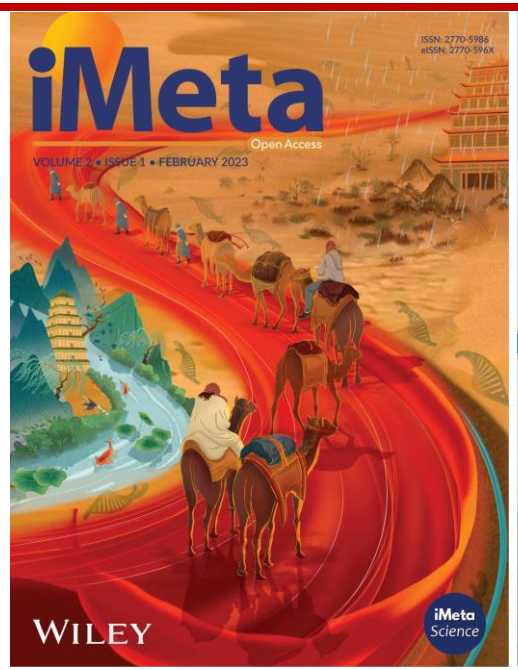

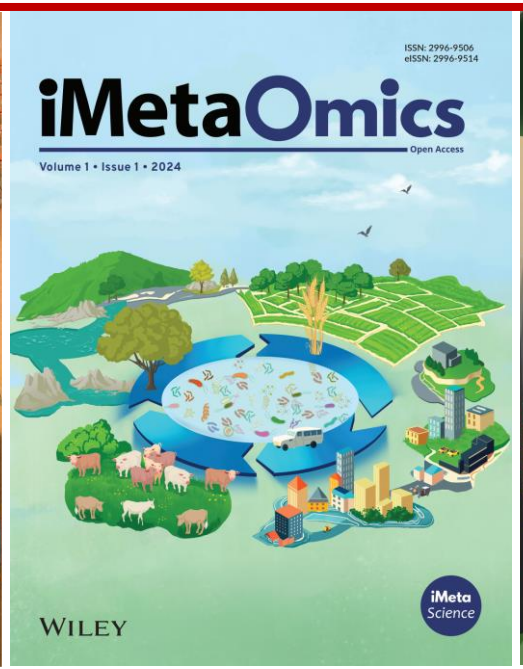

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