

PENGARUH LENDIR *ACHATINA FULICA* TERHADAP EKSPRESI MMP-3 DAN MMP-12 PADA PENUAAN FIBROBLAS AKIBAT PAJANAN SINAR ULTRAVIOLET B

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INTISARI

Latar belakang: Penuaan terjadi secara intrinsik dan secara ekstrinsik. Penuaan secara ekstrinsik dipengaruhi oleh adanya radiasi sinar matahari, terutama sinar ultraviolet B (UVB). Radiasi sinar UVB akan meningkatkan degradasi matriks ekstraseluler oleh berbagai macam enzim yang dihasilkan oleh sel fibroblas pada kulit, salah satunya MMP-3 dan MMP-12. *Achatina fulica*, salah satu spesies bekicot Afrika yang banyak ditemukan di Indonesia, mengandung komponen anti-penuaan yang dapat mencegah penuaan dini akibat radiasi sinar matahari.

Tujuan: Menkaji mekanisme molekuler *Achatina fulica* dalam menekan proses penuaan fibroblas akibat paparan Sinar UVB dengan melihat ekspresi MMP-3 dan MMP-12.

Metode: Penelitian ini menggunakan desain *post-test only experimental*. Kultur fibroblas kulit manusia, dibagi menjadi 6 kelompok untuk masing-masing variabel terikat (MMP-3 dan MMP-12): Kontrol normal (NC), fibroblas dalam medium lengkap; kontrol negatif (UVB), fibroblas+UVB 100mJ/cm² dalam medium lengkap; kontrol positif (PRP), fibroblas+UVB 100mJ/cm²+PRP dalam medium lengkap; AF3, fibroblas+UVB 100mJ/cm²+AF 3µg/mL dalam medium lengkap; AF15: fibroblas+100mJ/cm²+AF 15µg/mL dalam medium lengkap; dan AF62, fibroblas+UVB 100mJ/cm²+AF 62µg/mL dalam medium lengkap. Kemudian, pada setiap kelompok dilihat ekspresi mRNA MMP-3 dan MMP-12 menggunakan qPCR.

Hasil: Ekspresi mRNA MMP-3 dan MMP-12 pada kelompok UVB lebih tinggi daripada kelompok NC (MMP-3: 14,589 ± 3,206 vs. 1,000 ± 0,000; MMP-12: 14,735 ± 1,918 vs. 1,000 ± 0,000). Pemberian PRP pada kelompok PRP (MMP-3: 4,214 ± 0,560; MMP-12: 4,142 ± 0,133) menghasilkan ekspresi mRNA MMP-3 dan MMP-12 yang lebih rendah daripada kelompok UVB. Pemberian lendir *Achatina fulica* pada kelompok perlakuan AF3, AF15, dan AF62 menghasilkan ekspresi mRNA MMP-3 dan MMP-12 yang lebih rendah daripada kelompok UVB (MMP-3: (AF3) 8,386 ± 0,256, (AF15) 6,098 ± 0,751, (AF62) 2,981 ± 0,691; MMP-12: (AF3) 8,485 ± 0,641, (AF15) 5,928 ± 0,323, (AF62) 3,742 ± 0,214). *Mean* ± SD antarkelompok didapatkan memiliki perbedaan yang signifikan secara statistik ($p < 0,05$), kecuali pada ekspresi mRNA MMP-12 antara kelompok PRP vs. AF62. Ekspresi MMP-3 dan MMP-12 berkorelasi sangat kuat secara positif ($r = 0,973$) dan signifikan secara statistik ($p = 0,000$).

Kesimpulan: Ekspresi MMP-3 dan MMP-12 pada penuaan fibroblas akibat paparan sinar ultraviolet B yang diberikan lendir *Achatina fulica* lebih rendah daripada kontrol negatif dan terdapat korelasi positif yang sangat kuat antara ekspresi MMP-3 dan ekspresi MMP-12.

Kata kunci: UVB, fibroblast, *Achatina fulica*, MMP-3, MMP-12.

THE EFFECTS OF MUCUS OF *ACHATINA FULICA* ON THE EXPRESSION OF MMP-3 AND MMP-12 IN FIBROBLAST AGING DUE TO ULTRAVIOLET B EXPOSURE

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ABSTRACT

Background: Aging occurs intrinsically and extrinsically. Extrinsic aging is influenced by the sunlight, especially ultraviolet B. Ultraviolet B increases the degradation of extracellular matrix by various enzymes produced by skin fibroblast, such as MMP-3 and MMP-12. *Achatina fulica*, a species of African snails which is widely found in Indonesia has anti-aging components which can prevent early aging due to the sunlight.

Aim: To study molecular mechanism of *Achatina fulica* in suppressing ultraviolet B-induced fibroblast aging by investigating the expression of MMP-3 and MMP-12.

Method: This study was a post-test only experimental study. Human skin fibroblast culture were classified into 6 groups for each dependent variable (MMP-3 and MMP-12): normal control (NC), fibroblast in a complete medium; negative control (UVB), fibroblast + UVB 100mJ/cm² in a complete medium; positive control (PRP), fibroblast + UVB 100mJ/cm² + PRP in a complete medium; AF3 group, fibroblast+ UVB 100mJ/cm² + AF 3µg/mL in a complete medium; AF15 group, fibroblast+ UVB 100mJ/cm² + AF 15µg/mL in a complete medium; AF62 group, fibroblast+ UVB 100mJ/cm² + AF 62µg/mL in a complete medium. Then, each group was tested to analyse the mRNA expression of MMP-3 and MMP-12 by performing qPCR.

Result: The means of MMP-3 and MMP-12 mRNA expression in UVB group were higher than NC group (MMP-3: 14.589 ± 3.206 vs. 1.000 ± 0.000; MMP-12: 14.735 ± 1.918 vs. 1.000 ± 0.000). Treatment of PRP in PRP group (MMP-3: 4.214 ± 0.560; MMP-12: 4.142 ± 0.133) resulted in a lower MMP-3 and MMP-12 mRNA expression than UVB group. Treatment of mucus of *Achatina fulica* in AF3, AF15, and AF62 groups resulted in lower MMP-3 and MMP-12 mRNA expressions than UVB group (respectively MMP-3: (AF3) 8.386 ± 0.256, (AF15) 6.098 ± 0.751, (AF62) 3.742 ± 0.214; MMP-12: (AF3) 8.485 ± 0.641, (AF15) 5.928 ± 0.323, (AF62) 3.742 ± 0.214). The differences of means ± SD among each group were found to be significant statistically (p<0.05), except for the mRNA expression of MMP-12 in group PRP vs. AF62. Expression of MMP-3 and MMP-12 mRNA were found to correlate positively and very strongly (r = 0.973) and significantly (p=0.000).

Conclusion: Expression of MMP-3 and MMP-12 in ultraviolet B-induced fibroblast aging treated by *Achatina fulica* mucus are lower compared to negative control and there is a very strong positive correlation between the expression of MMP-3 and MMP-12.

Keywords: UVB, fibroblast, *Achatina fulica*, MMP-3, MMP-12.