Investigation of the antimicrobial and physico-mechanical properties of nature-friendly nanosilver-loaded pig lining leather prepared using exhaustion method

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The AgPBL was synthesized under optimized conditions following the methodology outlined in our previously published work [42]. The properties of AgPBL were characterized using UV-vis and TEM analyses.

The UV-vis spectrum depicted in Figure S1 exhibited a maximum absorption peak at 483 nm, attributed to the surface plasmon resonance (SPR) of spherical silver nanoparticles.
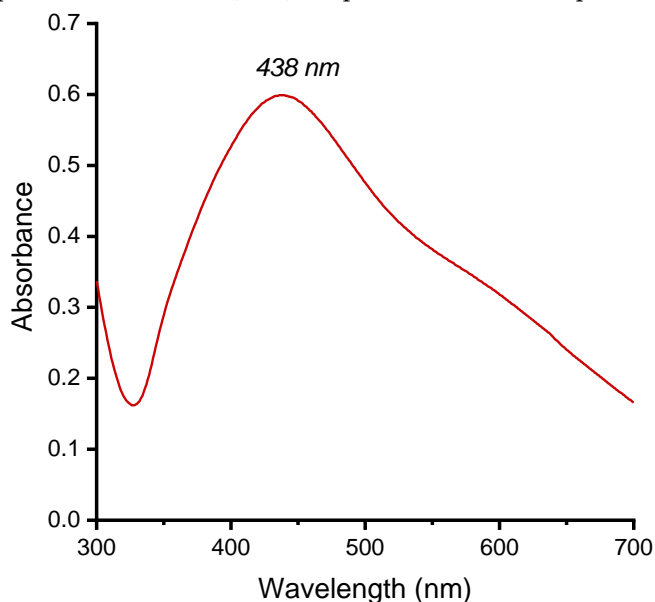

Figure S1. UV-vis spectrum of the bio-synthesized AgPBL.

The average size of AgPBL was calculated from the absorption spectrum using equation S1 [51]:

$$D = h.v_f/\pi.\Delta E_{half} \qquad (S1)$$

where

D is the diameter of the particle;

h is the Planck's constant;

v_f is the Fermi velocity of electrons in bulk silver;

ΔE_{half} is the full width at half maximum (**FWHM**) of the absorption band.

Based on the obtained UV-vis spectrum of AgPBL, the ΔE_{half} value was estimated to be 182 nm. Thus, the average sizes of AgPBL were calculated to be approximately 18 nm. Furthermore, the shape of SPR band observed in the UV-Vis spectrum confirmed the presence of spherical-shaped nanoparticles with a relatively uniform size of AgPBL [52].

The TEM images of AgPBL shown in Figure S2a,b visually confirmed the presence of spherical-shaped nanoparticles. The diameter of the nanoparticles was measured using Java Image Processing Software Image J (Image J 1.53, National Institutes of Health, Bethesda, MD, USA), and the size distribution histogram was plotted in Figure S2c. The analysis revealed that AgPBL exhibited a narrow size distribution and the average particle size was determined to be 18.4 ± 4.6 nm using Image J software [53,54].
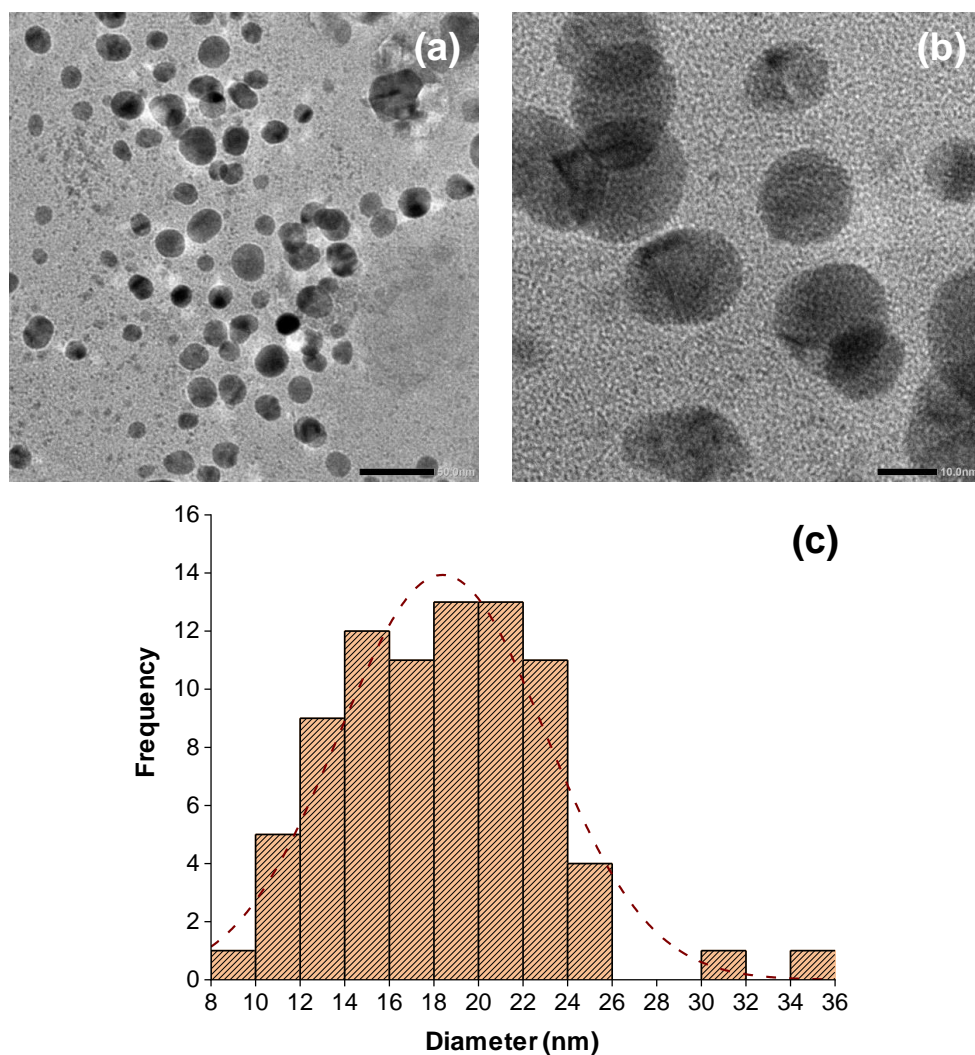

Figure S2. TEM images of the AgPBL with magnification of (a) ×100k and (c) ×400k; (c) The particle size distribution of the AgPBL as measured by Image J software.