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# Surface thermodynamics approach to *Mycobacterium tuberculosis* (M-TB) – Human sputum interactions

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This research work presents the surface thermodynamics approach to M-TB/HIV-Human sputum interactions. This involved the use of the Hamaker coefficient concept as a surface energetics tool in determining the interaction processes, with the surface interfacial energies explained using van der Waals concept of particle interactions. The Lifshitz derivation for van der Waals forces was applied as an alternative to the contact angle approach which has been widely used in other biological systems. The methodology involved taking sputum samples from twenty infected persons and from twenty uninfected persons for absorbance measurement using a digital Ultraviolet visible Spectrophotometer. The variables required for the computations with the Lifshitz formula were derived from the absorbance data. The Matlab software tools were used in the mathematical analysis of the data produced from the experiments (absorbance values). The Hamaker constants and the combined Hamaker coefficients were obtained using the values of the dielectric constant together with the Lifshitz Equation. The absolute combined Hamaker coefficients A132abs and A131abs on both infected and uninfected sputum samples gave the values of A132abs = 0.21631x10-21Joule for M-TB infected sputum and Ã132abs = 0.18825x10-21Joule for M-TB/HIV infected sputum. The significance of this result is the positive value of the absolute combined Hamaker coefficient which suggests the existence of net positive van der waals forces demonstrating an attraction between the bacteria and the macrophage. This however, implies that infection can occur. It was also shown that in the presence of HIV, the interaction energy is reduced by 13% conforming adverse effects observed in HIV patients suffering from tuberculosis.

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