

Chapter 161

How Does Ultrasound Work?



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| What are ultrasonic sound waves? | High-frequency sound waves >20 kHz. Typical diagnostic frequencies are between 1 and 20 MHz [1, 2]. |
| How do US create images? | High-frequency sound waves produced by the transducer reflect off objects in the body and return to the transducer at different time points (echoes) [1]. |
| How are sound waves generated? | Electric energy is transformed into mechanical energy (sound wave) in piezoelectric crystals in the ultrasound transducer. When the sound waves echo back to the transducer, the mechanical energy is transformed back into a measurable electrical signal by the crystals [3]. |
| What is the speed of sound in human tissue? | 1540 m/s [1] |
| What is B-mode US (2D mode)? | B-mode US creates a two-dimensional image in real time. When you see an US image of the solid organs, you are seeing a B-mode US image [1]. |

(continued)

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| How does wavelength influence tissue penetration depth in US? | Longer wavelengths have deeper tissue penetration, but have poorer axial resolution (decreased ability to delineate two objects in the same direction as the transducer) [1–3]. |
| What is US gain? | Ultrasound gain is an adjustable setting that controls the amplification of echoes displayed. The higher the gain, the brighter the image [3]. |

References

1. Huda W. Review of radiologic physics. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2016.
2. Bushberg JT, Seibert JA, Leidholdt EM Jr, Boone JM. The essential physics of medical imaging. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2012.
3. Hertzberg BS, Middleton WD. Ultrasound: the requisites. 3rd ed. Philadelphia: Elsevier; 2016.