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Theranostics: The Future of Personalized Medicine.

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Introduction

Theranostics is an emerging field in medicine that combines therapy and diagnostics into a single, integrated approach. By simultaneously diagnosing and treating diseases, especially cancer, theranostics aims to tailor treatments to individual patients, improving efficacy while minimizing side effects. This precision-driven strategy represents a major leap toward personalized medicine.The term "theranostics" merges therapy and diagnostics. It involves using specific diagnostic tests to identify patients who will benefit from a particular treatment, followed by targeted therapy designed to treat the identified condition. This approach often utilizes molecular imaging techniques and targeted drug delivery systems [1-3].

Specialized imaging agents or tracers are used to detect the presence and extent of disease, often at the molecular or cellular level.The imaging reveals molecular targets or biomarkers expressed by diseased cells.Therapeutic agents, often linked to the same or similar molecules used in imaging, are delivered precisely to the diseased cells.Response to therapy is monitored in real time using diagnostic tools, allowing treatment adjustments.Use of radiolabeled molecules that both image tumors and deliver radiation therapy. Examples: Prostate-specific membrane antigen (PSMA) targeting in prostate cancer; using PET imaging to guide radionuclide therapy..0 Imaging plaques in arteries followed by localized drug delivery to prevent heart attacks. Targeted therapies guided by diagnostic imaging to treat conditions like Alzheimer's disease or Parkinson's [4-6].

Tailors therapies based on patient-specific molecular profiles.Targets diseased cells precisely, sparing healthy tissue.Limits systemic exposure to toxic drugs.Enables timely adjustments to treatment plans.Potentially reduces trial-and-error prescribing and hospital stays [7].

PET, SPECT, and MRI using targeted contrast agents.Nanoparticles designed for simultaneous imaging and drug delivery.Radioactive elements attached to targeting molecules for diagnosis and therapy.Genetic and proteomic profiling for precise targeting.Creating safe, effective theranostic agents requires multidisciplinary collaboration.Approval pathways can be complicated due to combined diagnostic and therapeutic nature.High development and production costs may limit availability. Identifying appropriate candidates requires advanced diagnostics.Ongoing research aims to broaden applications beyond oncology, improve agent specificity, and integrate AI for enhanced image analysis and treatment planning [8-10].

Conclusion

Theranostics represents a transformative approach in healthcare by integrating diagnosis and treatment into a unified strategy. Its promise of personalized, precise, and adaptive therapy marks a new era in medicine, potentially improving outcomes for patients with complex diseases. As technology

advances, theranostics is poised to become a standard component of personalized medicine worldwide.

References

1. Pollack MG, Fair RB, Shenderov AD. Electrowetting-based actuation of liquid droplets for microfluidic applications. Appl phys let. 2000;11;77(11):1725-6.
2. Chiou PY, Moon H, Toshiyoshi H, et al. Light actuation of liquid by optoelectrowetting. Sens. Actuator A Phys. 2003;15;104(3):222-8.
3. Park SY, Teitell MA, Chiou EP. Single-sided continuous optoelectrowetting for droplet manipulation with light patterns. Lab Chip. 2010;10(13):1655-61.
4. Gaudet M, Arscott S. Optical actuation of microelectromechanical systems using photoelectrowetting. Appl phys let. 2012;28;100(22):224103
5. Arscott S. Moving liquids with light: Photoelectrowetting on semiconductors. Sci. Rep. 2011;7;1(1):1-