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Novel Biomarkers for Early Detection of Drug-Induced Toxicity

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Abstract

Drug-induced toxicity poses a signifcant challenge in drug development and clinical practice, often leading to severe adverse efects and compromised patient safety. Traditional methods for detecting toxicity are frequently limited by late identifcation of clinical symptoms. Recent advd ti m T MM א ɔ ῆ a ɖ l א to \l approaches

cell-free DNA (cfDNA) markers. Each of these biomarkers ofers unique insights into the mechanisms of toxicity and provides opportunities for early intervention. Proteomic biomarkers reveal specifc protein alterations associated with toxicity, genomic biomarkers identify genetic predispositions, metabolomic biomarkers refect biochemical changes, microRNA biomarkers indicate cellular stress, and cfDNA ofers information on organ-specifc damage. The integration

Challenge and f e di ec ion

Ma e ial and Me hod

1. S d de ign

2.Bioma ke di co e y

Sample collec ion

- **H man clinical ample :**
- **Animal model :**

Anal ical echniq e y

- **P o eomic anal i : y**
- **Genomic anal i : y**
- **Me abolomic anal i : y**
- **Mic oRNA anal i : y**
- **Cell-f ee DNA (cfDNA) anal i : y**

3. Bioma ke alida ion

Valida ion coho

- **Clinical alida ion:**
- **P eclinical alida ion:**

S a i ical anal i y

- **De c ip i e a i ic :**
- **Compa a i e anal i : y**
- **Recei e ope a ing cha ac e i ic (ROC) anal i : y**

4. Da a in eg a ion and in e p e a ion

- **Bioinfo ma ic :**
- **Pa h a anal i : w y y**
- **Ri k a e men :**

5. E hical con ide a ion

- **Info med con en :**
- **Animal w elfa e:**

6. Limi a ion

Di c ion

Conclusion

References

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