

Bölüm 31

ÇİP SİSTEMLERİNİN DİZAYNI VE TIP ALANINDA KULLANIMI

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Mikrofizyolojik sistemler veya 'doku çipleri' olarak da bilinen çip sistemleri üzerindeki organlar (Organ-on-a-Chip (OCC)), ilaç keşfi ve geliştirme sürecinin birçok aşamasında bilgilendirici olma potansiyelleri nedeniyle son yıllarda büyük ilgi görmüştür(1). Bu yenilikçi cihazlar, normal insan organ fonksiyonu ve hastalık patofizyolojisi hakkında bilgi sağlayabilir, aynı zamanda insanlarda araştırma ilaçlarının güvenliğini ve etkinliğini daha doğru bir şekilde tahmin edebilir. Bu nedenle, kısa vadede geleneksel prelinik hücre kültürü yöntemlerine ve *in vivo* hayvan çalışmalarına alternatif haline gelmeleri ve bazı durumlarda daha uzun vadede bunların yerine geçmeleri muhtemeldir. Son on yılda, çip sistemleri alanı, biyoloji ve mühendisliğin birleşimi ile, fizyolojik düzeyinin gösterilmesinde ve uygulama yelpazesinde ilerlemeler gösterdi. Bu ilerlemeler aynı zamanda yeni zorlukları ve fırsatları da ortaya çıkarmış ve temel çevrimsel uygulamalar için çip sistemleri vaatlerini tam olarak gerçekleştirmek için birden fazla biyomedikal ve mühendislik alanından uzmanlığa ihtiyaç duyulmaktadır. Bu inceleme, bu hızlı gelişen teknolojinin bir anlık görüntüsünü sağlar, mevcut uygulamaları ve bunların uygulanmasına yönelik uyarıları tartışır ve önümüzdeki on yıl için önemli öneriler sunar. İlaç geliştirme yavaş ve maliyetlidir, esas olarak klinik çalışmalardaki yüksek yıpranma oranlarından kaynaklanmaktadır. İnsan hastalıklarının moleküler temellerini anlamamızda ve *in vivo* hücre, doku ve organ düzeyinde biyolojiyi modelleme becerimizde dikkate değer artışlar son

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hala bir eksiklik var. Önümüzdeki birkaç on yıl içinde, çok yönlü OCC'lerin geliştirilmesi şeklinde, bu alanda vaskülarize multiorgan-on-a-chip platformlarının geliştirilmesinde yeniliklere yol açan bazı büyük gelişmeler bekliyoruz. Mikro-teknolojilerdeki gelişmeler ve özellikle OCC cihazlarının geliştirilmesiyle birlikte, mikroakışkanlar, organ fizyolojisini taklit etmek ve organ fonksiyonelliğini tekrarlamak için biyoçiplerde insan organlarının yapı taşlarını kullanan sistemler geliştirmek için doku mühendisliği ile sorunsuz bir şekilde birleşmiştir. Bununla birlikte, OOC teknolojisinin gelişimi için bilim adamları, klinisyenler ve mühendisler arasında etkili ve yakın işbirliği gerektirir. Gelecekteki OOC cihazlarının, kişiselleştirilmiş çoklu organ platformları olması gerektiğine, klinisyenler ve eczacılık tarafından benimsenmesini kolaylaştırmak için bir biyoçip üzerindeki her hastanın karmaşıklığını hastadan türetilmiş hücreler veya doku biyopsileri kullanarak hastaların tedavisini hızlandırmak için kullanılacağına inanıyoruz.

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