BÖLÜM 9

Teranostik Nanotaşıyıcılar

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Giriş

Tanısal ve tedavi edici özelliklere sahip nanomateryallerin üretimi ve yaygınlaştırılmasındaki son gelişmeler, tıbbın geleceğini hızla şekillendirmektedir. Çeşitli hastalıkların tedavisine yönelik yenilikçi terapötik nanomateryallerin tasarımı ve üretiminde önemli ilerleme kaydedilmiştir, ancak bunların potansiyelleri şu anda düşük biyoyararlanım, biyouyumluluk veya istenmeyen farmakokinetik nedeniyle sınırlı olup, yaygın klinik kullanımlarını engellemektedir.

En sık kullanılan intravenöz (IV) uygulamaya ek olarak inovatif nanomateryallerin çeşitli uygulama yolları, bu sistemlerin verilmesini kolaylaştırabilmek, biyolojik engelleri ekarte ederek görüntülemeyi artırmak, belirli kullanım durumlarında duyarlılık ve terapötik etkinlik potansiyelinin faydalarını keşfetmek için derinlemesine açıklanmıştır. Nanopartikül ilaç taşıma sistemlerinin karşılaştığı en büyük zorluklardan bazıları bölgeye özgü hedefleme, nanopartiküllerin birikimi ve metabolizmadan güvenli şekilde atılım işlemidir. Bu bölümde teranostik nanopartiküller için en son teknolojiler özetlenmiş ve farklı hastalıkların teşhis, tanı ve tedavisinde kullanılan çeşitli uygulama yolları tartışılmıştır.

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4.3 Uzun Süreli Tedavi için İmplantasyon

Nanopartiküllerin IV yolla sistemik olarak verilmesi, ilaçların vücutta taşınabilmesine olanak sağlamaktadır. Ancak, hedefleme ligandlarına sahip nanopartiküler sistemlerde, spesifik olmayan dağılımdan kaçınılamaz. Sonuç olarak böbrekler dalak, ve karaciğer gibi hayati organlarda hasara ve sistemik toksisiteye neden olur (75, 76). Ek olarak, bu ilaçlar, nispeten vaskülarize olmayan veya kemik ve eklem hastalıkları veya kan-beyin bariyeri tarafından izole edilen bölgeleri hedefleme yetenekleri açısından da sınırlı olabilir (77, 78). Bu hastalıklar için nanopartiküler sistemleri taşıyan cihazların implantasyonu hedef bölgede lokal olarak ilaç iletimi sağlarken, istenilen bölgede ilacın etkili olduğu konsantrasyonu sağlayarak umut verici bir yaklaşım sunmaktadır (Şekil 3c) (12).

Sonuç

Nanoteranostik özelliklerinin ve uygulama yolunun dikkatli seçimi, hastalıkları teşhis edebilen ve terapötik etkiler sağlayan bir şekilde terapötik problar geliştirmek için kritik öneme sahiptir. Bu sistemler klinik olarak uygun şekilde tasarlandığında, nanoteranostiklerin hedef hastalık bölgesindeki birikimi arttırılabilir ve daha sonra küçük boyutları nedeniyle vücuttan atılırlar. Bunun yanı sıra, hastalık tespitini hızlandıran daha kestirme bir yol sağlayarak tedavinin etkinliğini arttırırlar. Ancak, büyük ilerlemelere rağmen teranostik problarda, sağlıklı dokulardaki hedef dışı etkilerden kaynaklı potansiyel toksisite riskleri nedeniyle klinik kullanımları engellenmektedir. Bu teranostik nanomalzemelerin potansiyelini tam olarak gerçekleştirmek için ek iyileştirmeler gereklidir.

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