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A Review on Magnetic Microsphere as Magical Novel Drug Delivery System

Chaitalee G. Girde, Bilal Sufi, Pratiksha Budhbaware, Prajwal Wankhade

New Montfort Institute of Pharmacy, Ashti, Wardha, Maharashtra, India chaitaligirde2020@gmail.com

Abstract: Magnetic microspheres hold great promise for reaching the goal of controlled and site specific drug delivery. A number of novel drug delivery systems have emerged encompassing various routes of administration, to achieve controlled and targeted drug delivery, magnetic micro carriers. Newer drug delivery systems are largely influencing the current medical practice. The application of Magnetic nanoparticles for drug targeting enables guiding the Magnetic microspheres to a target area, imaging the position of the Magnetic microspheres with magnetic particle imaging, and finally inducing drug release. Magnetic carriers receive magnetic responses to a magnetic field from incorporated materials that are used for magnetic microspheres are chitosan, dextran. The concept of targeted drug delivery is designed for attempting to concentrate the drug in the tissues of interest while reducing the relative concentration of the medication in the remaining tissues. The purpose of writing this review was to investigate, compile and present the recent as well as past literatures in more concise way with special focus on approaches which are currently utilized in the targeted therapy.

Keywords: Magnette, Targeting Therapy, Magnetic Nanoparticles (MNP), Magnetic Microspheres (MNS), Radioimmunoassay.

REFERENCES

- [1]. Zhu KJ, Hendren RW, Jensen K, Pitt CG. Synthesis, properties, and biodegradation of poly(1,3-trimethylene carbonate). Macromolecules 1991; 24(8): 1736-1740.
- [2]. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system: A review. J Acute Disease., 2011; 2(1): 1-12
- [3]. Luk, B.T. and L. Zhang, Current advances in polymer-based nanotheranostics for cancer treatment and diagnosis. ACS Appl Mater Interfaces, 2014. 6(24): p. 21859-73
- [4]. Dutz, S. and R. Hergt, Magnetic particle hyperthermia--a promising tumour therapy? Nanotechnology, 2014. 25(45): p. 452001.
- [5]. Deepa Batra, Satinder Kakar, Ramandeep Singh, Ujjwal Nautiyal, magnetic microspheres as a targeted drug delivery system: an overview, journal of drug delivery research, 2012; 1(3): 1-16
- [6]. Drug delivery systems (DDS) that can precisely control the release rates or target drugs to a specific body site have had an enormous impact on the health care system.
- [7]. Mathew T, Devi S, Prasanth V, Vinod B. 2010. Suitability of factorial design in determining the processing factors affecting entrapment efficiency of albumin microspheres. J Pharm Res. 3(5):1172-1177
- [8]. Vyas and Khar. Targeted and Controlled drug delivery (CBS Publishers and distributors, 2001
- [9]. Vyas SP, Khar Rk. Targeted & controlled drug delivery. New Delhi: CBC Publisher & distributors; 2004, p. 459-463.
- [10]. Jawed Akhtar Rajeev Chaturvedi, Jyoti Sharma, Deepak Mittal, Pankaj Pardhan, Review Article, Magnetized carrier as novel drug delivery system, International Journal of Drug Delivery Technology 2009; 1(1): 28-35.
- [11]. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system
- [12]. Journal of drug delivery research; ISSN 2319-1074
- [13]. Sieben, S., Bergemann, C., Lu"bbe, A., Brockmann, B., and Reischeleit, D. Comparison of different particles and methods for magnetic isolation of circulating tumor cells. J. Magn. Magn. Mater. (in press).

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- [14]. Turner RD, Rand RW and Bentson JR. Ferromagnetic Silicone Necrosis of Hypernephromas by Selective Vascular Occlusion to the Tumor: A New Technique. J. Urol. 113; 1975:455–59.
- [15]. Widder KJ, Senyei AE and Ranney DF. Magnetically Responsive Microspheres and Other Carriers for the Biophysical Targeting of Antitumor Agents. Adv. Pharmacol. Chemother. 16; 1979: 213–71. 38.
- [16]. Widder KJ, Morris RM and Poore GA. Selective targeting of magnetic albumin microspheres containing low-dosedoxorubicin: total remission in Yoshida sarcoma-bearing rats. Eur. J. Cancer Clin. Oncol. 19; 1983:135–39
- [17]. Widder DJ, Greif WL and Widder KJ. Magnetite Albumin Microspheres: A New MR Contrast Material. AJR. 148; 1987: 399–04.
- [18]. Kavita Kunchu, Raje Veera Ashwaniet al. Albumin Microspheres: AUnique system as drug deliverycarriers for non-steroidal anti-inflammatory drugs. 2010; 5: 12
- [19]. Chandna A, Batra D, Kakar S, Singh R. A review on target drug delivery: magnetic microspheres. J Acute Disease., 2013; 189-195
- [20]. Mathew ST, Gayathri DS, Prasanth VV, Vinod B. Suitability of factorial design in determining the processing factors affecting entrapment efficiency of albumin microspheres. J Pharm Res., 2010; 3(5): 1172-1177
- [21]. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system: A review. J Acute Disease., 2011; 2(1): 1-12
- [22]. MK, AHMED AB, SAHA D. Microsphere a Drug Delivery System–a Review. Int J Curr Pharm Res. 2019; 34–41.
- [23]. Vaibhav R, Satya SS, Roop S, Lal N, Pragya Y. REVIEW ARTICLE MICROSPHERES : A PROMISING DRUG CARRIER, 2016; 6: 18–26
- [24]. Nasra MK, Mohamed MM, Elblbesy MA, Hefney BA. Preparation of biocompatible magnetic microspheres with chitosan. J Biomater Nanobiotechnol., 2011; 2:194-200
- [25]. Jordan A, Scholz R, Haff MK, Johannsen M, Wust P. Presentation of a new magnetic field therapy system for the treatmrnt of human solid tumours with magnetic field hyperthermia. J Magnetism and Magnetic Materials., 2001; 225(1-2): 118-127
- [26]. Lubbe AS, Bergemann C and Riess H. Clinical experiences with magnetic drug targeting: A phase I study with 4'- epidoxorubicin in 14 patients with advanced solid tumors. Cancer Res. 56; 1996:4686–93.
- [27]. Lubbe AS, Alexiou C, and Bergemann C. Clinical applications of Magnetic Drug Targeting. J. Surg. Res. 95; 2001: 200–06.
- [28]. Goodwin S. Magnetic Targeted Carriers Offer Site-Specific Drug Delivery. Oncol. News Int. 9; 2000: 22
- [29]. Safarik I, Safarikova M. Review: Use of magnetic techniques for the isolation of cells. J Chromatogr B Biomed Sci Appl., 1999; 722(1-2): 33-53.
- [30]. Hafeli UO. Magnetically modulated therapeutic systems. Int. J. Pharmaceutics. 277 (1-2); 2004: 19-24.
- [31]. Saiyed ZM, Telang SD, Ramchan CN. Application of magnetic techniques in the field of drug discovery and biomedicine. Biomagn Res Technol., 2003; 1(1): 2.
- [32]. Bahadur D, Giri and Sadhana J. 28; 2003:639-656
- [33]. Burnside BA, Keith AP, Snipes W. Micro porous hollow fibers as a peptide delivery system via the buccal activity. proceed inte. symp contro. Rel Bioact mater., 1989; 16: 94.
- [34]. Mathew ST, Gayathri DS, Prasanth VV, Vinod B. Suitability of factorial design in determining the processing factors affecting entrapment efficiency of albumin microspheres. J Pharm Res., 2010; 3(5): 1172-1177
- [35]. Vyas MB, Doijad RC, Manvi FV, Shah SK. Design and characterization of cisplatin magnetic microspheres Int J Biopharmaceutics., 2013; 4(2): 66-72.
- [36]. Zhao H, KatayounSaatchi, Hafeli UO. Preparation of biodegradable magnetic microspheres with poly (lacticacid)-coated magnetite. J Magnetism and Magnetic Materials., 2009; 321: 1356–1363.
- [37]. Journal of drug delivery research; ISSN 2319-1074.

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- [38]. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system: A review. J Acute Disease., 2011; 2(1): 1-12
- [39]. Zhao H, KatayounSaatchi, Hafeli UO. Preparation of biodegradable magnetic microspheres with poly (lacticacid)-coated magnetite. J Magnetism and Magnetic Materials., 2009; 321: 1356–1363.
- [40]. 4. Cax X, Koltypin Y, Prozorov R, Felner I, Gedanken A. Preparation and characterization of amorphous nanometer sized Fe3O4 powder. J Mater Chem., 1997; 7: 1007-1009.
- [41]. Chung TH, Lee WC. Preparation of styrene-based, magnetic polymer microspheres by a swelling and penetration process. React Funct Polym., 2008; 68: 1441-1447.
- [42]. Chang-Yun Chen, Qi Long, Xiao-Hua Li and Jiao Xu. Microwave-assisted preparation of magnetic albumin microspheres, Journal of Bioactive and Compatible Polymers, 2008; 23: 490-500.
- [43]. Parmar Harshad, Bakliwal, Sunil at al. Different Method of Evaluation of Mucoadhesive Microsphere, International Journal of Applied Biology and Pharmaceutical Technology. 2010; 1(3): 1164-1165.
- [44]. Harshad P, Sunil B, Nayan G, Bhushan R, Sunil P. Different Method of Evaluation of Mucoadhesive Microsphere. Int J Applied Biology and Pharm Tech., 2010; 1(3): 1164-1165.
- [45]. Thevenot, J.; Oliveira, H.; Sandre, O.; Lecommandoux, S. Chem. Soc. Rev. 2013, 42, 7099
- [46]. Jaiswal, M. K.; De, M.; Chou, S. S.; Vasavada, S.; Bleher, R.; Prasad, P. V.; Bahadur, D.; Dravid, V. P. ACS Appl. Mater. Interfaces 2014, 6, 6237.
- [47]. Wang, H.; Yang, J.; Li, Y.; Sun, L.; Liu, W. J. Mater. Chem. B 2013, 1, 43.
- [48]. Murali, R.; Vidhya, P.; Thanikaivelan, P. Carbohydr. Polym. 2014, 110, 440.
- [49]. Coughlan, D. C.; Corrigan, O. I. Int. J. Pharm. 2006, 313, 163.
- [50]. Satinder Kakar, Deepa Batra, Ramandeep Singh, Ujjwal Nautiyal. Magnetic Microspheres as Magical Novel Drug Delivery System: A review; Journal of acute disease 2013:1-12.
- [51]. Souhami RL, Harper PG, Linch D, et al. High-dose cyclophosphamide with autologous marrow transplantation as initial treatment of small cell carcinoma of the bronchus. Cancer Chemother Pharmocol 1982; 8: 31-34.
- [52]. Spitzer G, Dicke KA, Litam J, et al. High-dose combination chemotherapy with autologous bone marrow transplantation in adult solid tumours. Cancer 1980; 45: 3075-85.
- [53]. Dicke KA, Spitzer G, Zander AR, et al. Autologous bone marrow transplantation in relapsed adult acute leukaemia and solid tumours. Transplant Proc 1979; 11: 212-14.
- [54]. R. Weissleder, D.D. Stark, B.L. Engelstad et al., AJR 152 (1989) 167.
- [55]. R. Pieters, D.R. Huismans, A. Leyva et al., Br. J. Cancer 59 (1989) 217...
- [56]. J. Kreuter, Pharm. Acta Helv. 58 (1983) 242
- [57]. Vyas SP, Khar RK. Targeted & Controlled Drug DeliveryNovel Carrier systems. CBS Publications; 2004, p. 458-483.
- [58].] Zhang X, Chen F. A novel method to prepare magnetite chitosan microspheres conjugated with methotrexate for the controlled release of methotrexate as a magnetic targeting drug delivery system. Drug Delivery 2009; 16(5): 280-288
- [59]. Scherer F, Anton M, Schillinger U. Magnetofection: enhancing and targeting gene delivery by magnetic force in vitro and in vivo. Gene Ther 2002; 9: 102-109.
- [60]. 11. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system: A review. J Acute Disease., 2011; 2(1): 1-12.
- [61]. Kataria Sahill, Middha Akankshal, Sandhu Premjeetl, Ajay Bilandi and Bhawana, Kapoor, Microsphere: a review (2011), IJRPC, 1: 1184-1198.
- [62]. Surini S., Anggriani V., Anwar E., Study of Mucoadhesive Microspheres Based on Pregelatinsed Cassava Starch Succinate as a New Carrier for Drug Delivery, J. Med. Sci. 2009; 9(6): 249-256.
- [63]. Le B, Shinkai M, Kitade T, Honda H, Yoshida J, Wakabayashi T, et al. Preparation of tumor-specific magnetoliposomes and their application for hyperthermia. J Chem Eng Jpn 2001; 34: 66-72.
- [64]. Lachman LA, Liberman HA, Kanig JL. The theory and practice of industrial pharmacy. Mumbai, India: Varghese Publishng House, 2005; 3: 414-415

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- [65]. Zhang X, Chen F. A novel method to prepare magnetite chitosan microspheres conjugated with methotrexate for the controlled release of methotrexate as a magnetic targeting drug delivery system. Drug Delivery 2009; 16(5): 280-288.
- [66]. Kakar S, Batra D, Singh R, Nautiyal U .Magnetic microspheres as magical novel drug delivery system: A review. J Acute Disease., 2011; 2(1): 1-12.
- [67]. Kakar S, Batra D, Singh R. Preparation and evaluation of magnetic microspheres of mesalamine (5-aminosalicylic acid) for colon drug delivery. J Acute Disease., 2013; 226-231.
- [68]. Lopez, C.R; Portero, A.; Vila-Jato, J.C. and Alonso, M.J. (1998) "Design and Evaluation of Chitosan/Ethylcellulose mucoadhesive bilayered devices for buccal drug delivery." J. control. Rel., 55: 143-152.
- [69]. Parodi, B.; Russo, E.; Caviglioli, G.; Cafaggi, S. and Binardi, G. (1996) "Development & characterization of a buccoadhesive dosage form of Oxydodone hydrochloride". Drug Dev. Ind. Pharm., 22(5):445-450.
- [70]. Chien, Y.W.; Corbo, D.C. and Liv, J.C. (1991) "Mucosal delivery of progestational Steroids from a Controlled release device: in vitro/in vivo relationship." Drug Dev. Ind. pharm., 17(17): 2269-2290.
- [71]. Cassidy, J.P.; Landcert, N.M. and Quardos, E. (1993) "controlled buccal delivery of buprenorphine". J. control. Rel., 25: 21-29.
- [72]. Dortune, B.; Ozer, L. and Vyanik, N. (1998) "Development and invitro Evaluation of buccoadhesive pindodlo tablet formulation." Drug Dev. Ind. pharm., 24(3): 281-288.

