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A New Paradigm in Tumor Therapy: Molecularly Targeted-Adoptive Cell Immunotherapy

Yunhao Lei

College of Medical Imaging, Dalian Medical University, Dalian, Liaoning, 116000, China
1239938941@qq.com

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Abstract: In recent years, cancer has become a major disease that poses a major threat to human health. Tumor therapy is an effective means to treat common symptoms such as cancerous cirrhosis and cerebral infarction, but there are still many problems to be solved in the clinical application of molecular targeted cross-linked immunotherapy. In this paper, the molecular targeted inoculation and secondary immune metabolism pathways of tumor therapy were studied, and their development prospects were prospected. The results showed that the application of molecular biology combined with molecular targeted cell model had a good effect in tumor patients. The experiment looked at the metabolism of cancer cells and found that there were differences between the metabolic rate and the overall average, but most were above the average metabolic rate of 11. This indicates that the immunotherapy effect of this model is better.

1. Introduction

Globally, cancer remains a very high incidence disease with a fatality rate of up to 50%. Patients with tumor are located all over the place, and there are serious malignant tumors problem in many areas of our country. According to statistics, there are more than 5,000 diseases alive and at risk of disappearing. Among them, most of the cancer cells showed the phenomenon of coupling line or semi-definite process. Cancer has become one of the most important problems threatening human life and health, especially nitrosamines such deadly metabolites, with powerful teratogenic effects, can lead to chromosome breakage and other lesions.

In this paper, the effects of molecular targeted hybridization on the immune ability of tumor patients were studied. The study method used molecular targeting to construct tumor model, and the results showed that the therapy had good safety, stability and anti-infectivity characteristics. By combining 2 genes to produce 16 antibodies, and obtaining the ordered genome sequence by heterogeneous cloning, the chromosomal targeting effect in the molecular-targeted hybrid offspring was realized.

At present, although molecular targeted sympathetic compounds are widely used in the field of immunology, there is no clear conclusion on their efficacy in tumor therapy. In this paper, the molecular target and site binding technology was used for experiments. The method is simple, effective and economical, and has been widely promoted and used to avoid drug failure or adverse reactions caused by overdose. However, potential risk factors for this approach have also been

identified: for example, polysaccharide compounds may affect the metabolic and functional properties of cells, thereby triggering immune rejection effects, leading to poor tumor treatment or the occurrence of infectious diseases.

2. Related Work

In the process of tumor treatment, immunotherapy is mainly used to target the implantation of drugs, so as to reduce the resistance of pathogenic bacteria. At the same time, virus and other harmful factors are inhibited by drug targeting protein receptor antagonism. At present, many researchers have introduced immunocloning technology, molecular targeted hybridization gene method and transgenic method into the field of biological control of cancer cells. The application of these technologies can effectively improve the function and resistance of the body's immune system, and promote its potential activity, so as to achieve the desired goal. Shuang Guo et al. are committed to developing metabolic related gene predictive indexes for ovarian cancer to predict prognosis and response to immunotherapy in ovarian cancer patients, as well as to identify potential drug candidates [1]. Khalil M et al. studied the effects of immunotherapy on tumor shrinkage, survival rate, surgical risk and postoperative rehabilitation, explored the potential of immunotherapy treatment for patients with microsatellite unstable colorectal cancer, and provided guidance for clinical practice [2]. Yunfang Wei et al. discussed the application of machine learning and RNA in improving the efficacy of anti-tumor immunotherapy, and proposed a method combining machine learning algorithm and RNA data analysis to improve the efficacy of immunotherapy [3]. Qiong Wu et al. focused on predicting the efficacy of immunotherapy for non-small cell lung cancer and proposed a multi-view adaptive weighted graph convolutional network to predict the response of NSCLC patients to immunotherapy [4]. Gulnur Ungan et al. analyzed the application of radiomics in discovering prognostic markers of immunotherapy for metastatic melanoma, and used feature selection and classification techniques to identify important markers [5]. Levente Kovacs et al. used the pulse control framework to optimize the timing and intensity of tumor therapy to achieve better tumor control [6]. Yuyue Zhang et al. analyzed the interaction model of tumor immune system and studied the influence of dendritic cell therapy and immune response delay on the interaction dynamics of tumor immune system [7]. Asghar Mesbahi et al. conducted computer analysis to optimize photon energy spectrum and beam parameters of iodine nanoparticle assisted positive voltage radiation therapy for brain tumors, and used a simulation-based approach to optimize treatment strategies for brain tumor patients [8]. Marton Gyorgy Almasy et al. introduced a review of tumor dynamics and formulation reward function modeling in treatment optimization based on reinforcement learning, and discussed the application of reinforcement learning technology in optimizing cancer treatment [9]. Ahad Mohammadi et al. studied the thermomechanical model of tumor laser ablation therapy, and carried out sensitivity analysis and optimization of influencing factors to improve the efficiency of laser ablation therapy [10]. The above is some research progress in the process of tumor treatment, using immunotherapy to carry out targeted implantation of drugs in patients and reduce the resistance of pathogenic bacteria. These studies provide new ideas and methods for the development of cancer treatment, so that treatment can be more individualized and precise.

3. Method

3.1 Cellular Immune Technology

Cell targeted immunotechnology represents an innovative biological therapy, the core of which is to use specific antibodies (T-DNA) as antigens, through the selection of appropriate protein or

peptide binding sites, to achieve targeted and specific recognition and localization of specific targets. In the field of molecular targeted immunity, antibodies play a crucial role. Because of its large specific surface area, it is widely used in the process of cell proliferation. In addition, antibodies also have excellent biocompatibility and stability, as well as specific reaction capabilities (such as heat resistance and oxidation resistance) [11-12]. Through the selection of specific antigens, this technology realizes the targeted differentiation of cells, thereby enhancing the body's resistance to disease, exploring a new way. In this technology, multi-factor or different concentrations of proteins, nucleic acids and other substances can also be selected as immune sources, and drugs can interact with antibodies to form reversible complexes. Cellular immunity technology is a method to study and utilize cells in the body's immune system to participate in immune response [13-14]. Cell counting is one of the commonly used experimental methods in cellular immunity technology, and its counting formula can be expressed as:

$$N = C \times V/D \tag{1}$$

Among them, N represents the number of cells actually counted, C is the number of cells observed under a microscope, V is the effective volume used, and D is the dilution factor. Cell proliferation inhibition rate is used to assess the effect of a drug or treatment on cell proliferation. The formula can be expressed as:

$$Inhibitionrate = \left(1- \left(A-B\right)/E\right) \times 100\% \tag{2}$$

A represents the number of cells in the treated group, B represents the number of cells in the untreated control group, and E represents the number of cells in the positive control group without inhibition. In cellular immunity technology, it is very important to evaluate the viability of immune cells and measure the survival rate of cells. This formula is expressed as:

$$Cell\ viability(\%) = (Live\ cells/Total\ cells) \times 100\% \tag{3}$$

The number of living cells is defined as live cells, while the Total number of cells refers to Total cells. Antigen-specific drugs are drugs that form specific functional structures and physiological active ingredients by selecting different types, proteins, amino acids and various excipients. At present, this technology has been successfully applied to tumor patients as a way of combining drugs with biotargeted cells, and it can also be applied to different types of drugs to promote the body's resistance mechanism to diseases or drugs [15-16]. This technology improves bioavailability by controlling or reducing drug concentration, and combined with genetic regulation and gene expression technology, it can effectively change human hormone levels and metabolic processes. It can also modify the immunoglobulins in cells to make them specific and resistant, so as to enhance the antibodies and immunity in tumor patients to a certain extent. This method can cause the immune effect on cells to a certain extent and realize the selective treatment of drugs. By changing the patient's own or surrounding environment, the frequency and efficacy of the disease can be controlled, and even the tumor can be implanted into the human body, forming a stable, efficient and sustainable system. Genetic cloning is a research method based on gene mutation and combined with molecular biology technology, which is characterized by drug molecular targeting receptors with specific and effective biodegradation properties [17-18].

3.2 Structure of Molecular Target-Adoptive Therapy

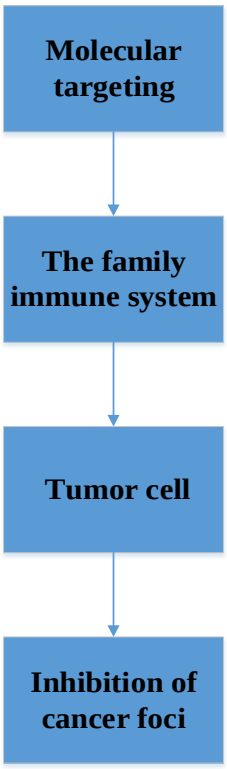

Figure 1: Therapeutic process

In this therapeutic framework, the main goal is to act on tumor cells by the familial immune system, enhancing their antigenicity and producing antibodies. The familial locking system is used to suppress humoral immune response. Its treatment process is shown in Figure 1. The specificity and selectivity of the body as well as the high affinity of the drug itself may lead to rejection or competitive damage after binding with the host tissue. In addition, the therapeutic framework can also promote the transfer of other biological factors on cells and target organs by activating negative regulatory effects in body fluids. Protection of tumor cells is one of the important functions of this therapeutic framework. The transmission of genetic signals can be achieved through genetic mutations and metabolites (e.g. secondary uterine cancer, ovarian cancer). Immunosuppressive drugs can effectively improve patients' awareness of their own diseases and self-monitoring ability, reduce the risk of disease, reduce complications and recurrence rate. For tumor patients, antibodies or antitoxin vaccines can be used to control the induced body conduction response mediated by their own cells, promote the targeted function in vivo, and use molecular targeted progesterone and embedding hormone to inhibit the production of inflammatory factors in the body. However, these treatments have certain limitations and need to be improved and optimized continuously. At the same time, immune rejection may enhance the toxicity of drugs [19-20]. In the process of tumor therapy, the targeting of progesterone and drugs by radioimmunomolecules has become the most important metabolic mode of tumor cells in clinical practice. This complex disease consists of a variety of compounds that interact in the body's various organ tissues and work together to produce a particular product. The main components include nucleic acids, proteins and antibodies, which constitute the maternal DNA sequence and provide the basis for immune regulation. Specific antigens (such as immunoglobulins, etc.) are used to isolate, protect and bandage tumor patients. Secondly, the concentration of lymphocytes in the cancer foci is reduced by drug encapsulation,

thereby inhibiting the sympathetic response between the tumor and other tissues and promoting the formation of a targeted trait - adoptive compound - maternal antibody or metabolite. In this treatment structure, the primary task is to select the drug according to the patient's situation, and then determine the best targeted treatment regimen based on the specific situation. Since the efficacy of different types of antibiotics varies, the specific situation should be determined. Some of these antibiotics can regulate the level of immunoglobulin to control the concentration required for tumor cell growth and inhibit cancer foci. Others may improve the treatment to some extent. By adjusting the drug composition, the clinical treatment goal can be better achieved, and the quality of life and health of patients can be improved.

4. Results and Discussion

4.1 New Tumor Treatment Model Process

The basis of cancer treatment is traditional chemotherapy and radiotherapy. In the course of treatment, the patient's immune function must be comprehensively evaluated, and the targeted effects of the drug on specific cells and tumor genes must be considered. Therefore, the unique characteristics of an individual must be considered when selecting the appropriate targeted therapy. Studies have shown that this new model can enhance the immunity of patients, reduce the risk of disease, and improve the body's resistance is crucial. Chromosomal aberrations are caused to a certain extent by mutations within the cancer embryo or tissue, which affect the growth and development of tumor cells, thereby triggering toxic effects, which in turn introduce radiation techniques into the interior of tumor cells. This method is suitable for tumors with specific activity, no risk of infection and non-toxic sexual properties. The principle lies in the presence of some molecules, such as glycoproteases, that can cause tissue chromosome damage or create new aberrations. Table 1 shows the tumor test data.

Table 1: Test data for the tumor

Number	Tumor area in the treated group (cm^2)
1	3.2
2	5.1
3	4.8
4	6.5
5	2.9
6	4.3
7	5.9
8	3.7
9	6.1
10	4.5

In cancer therapy, these special molecules cause a certain amount of damage to the targeted immune system, leading to cell death. When the whole system is relatively stable, this paper needs to consider the mutual repulsion between the drug molecule and the target. If the patient develops certain diseases or immune disorders, it may cause the patient to have a tendency to be unwilling or refuse to participate in treatment (as in other cancers), which may also lead to death or loss of resistance. At the same time, this also affects the selection of certain substances and sensitive factors by the tumor cells themselves, as well as the effects generated in the whole system.

4.2 Analysis of Therapeutic Effect

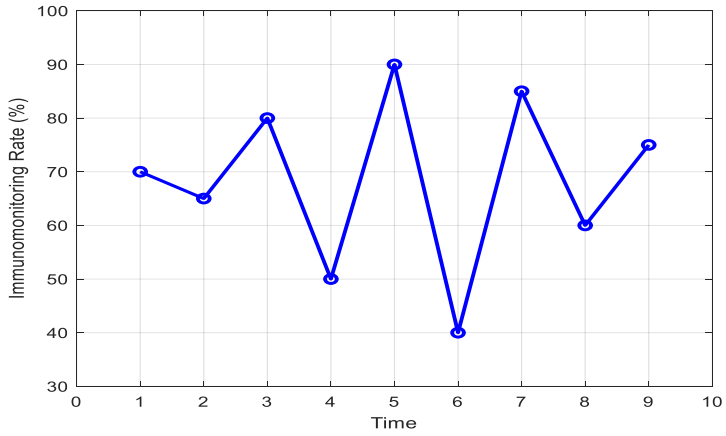

Figure 2: Immunomonitoring rate

Immunoassay has the ability to effectively monitor the condition of patients. In the field of modern medicine, the combination of antibodies and antigens is often used to detect the presence of tumors. This approach can quickly and accurately identify the type and size of tumor cells, as well as treatment strategies, and adjust accordingly to minimize the risk of infection or to mitigate the harm of the disease. According to the data in Figure 2, the immune surveillance rates were 70, 65, 80, 50, 90, 40, 85, 60 and 75, respectively. The overall trend shows that immunization surveillance rates fluctuate significantly, sometimes fluctuating. This may mean that during the course of treatment, the patient's immune system has experienced multiple fluctuations of varying degrees, and there is a degree of uncertainty about the effectiveness of the treatment and the patient's response. Through the analysis of the new treatment model, the fluctuation of the immune monitoring rate during the treatment can be visually observed, which is helpful for doctors to evaluate the treatment effect and timely adjust the treatment plan to achieve a better tumor treatment effect.

Before the application of molecularly targeted drug therapy, the patient must be pretreated with drugs, usually antibiotics, to remove the bacteria. Different concentrations of antibiotics should be used in the course of treatment according to the specific situation. At present, the common method is to combine alkaloids, organic acids, vitamins and other substances, among which the most important is to use inorganic salts and carbohydrates to work together to produce enzyme immune factors to inhibit cell growth and metabolic activities, so as to enhance the therapeutic effect; the second is protein-fat interaction leading to cell cycle changes that affect the rate and stability of drug release in the body. According to the data, the data in Figure 3 showed fluctuations, which were 7.10, 11.92, 14.43, 17.23, 20.00, 20.44, 19.01, 15.76, 10.60 and 4.41 respectively. These fluctuations may reflect that the metabolism of molecularly targeted drugs is affected by a variety of internal and external factors, including drug concentration and enzyme activity. The graph shows the ebb and flow of metabolic rate, sometimes up, sometimes down. The figure below in Figure 3 also adds the average metabolic rate line, whose data is 11. The difference between the metabolic rate of each sample and the overall average level can be compared through Figure 3, but most of them are above the average metabolic rate. Overall, the new model of molecular-targeted optimization studied in this paper performs well in terms of metabolic rate performance.

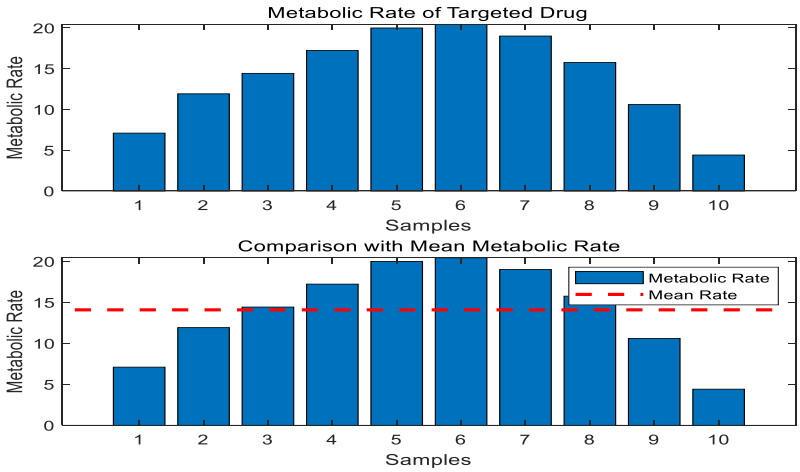

Figure 3: Molecularly targeted drug metabolic rate

5. Conclusion

This paper introduces a new tumor treatment method and studies its clinical feasibility. By using radioimmune compounds as targeted molecules and combining chemical sympathetic technology with molecular targeting, the information sequence model of the treatment scheme was established, including immune detection rate and drug metabolic rate. The validity of these data was verified by a comparative study of the therapeutic regimen evaluated by molecular targeted analysis. However, due to certain bias in the screening process of tumor cells targeting newborn species, it may be affected by some uncontrollable factors in practical application, such as gene mutations and hormone levels. In addition, problems such as lack of systematic theoretical guidance and evaluation criteria also need to be further studied and solved. Therefore, this paper needs to continuously improve the experimental protocol to improve the effectiveness of the treatment and make it more accurate to ensure the optimal efficacy. Although the research has high results and application value, there are still many problems that need to be improved. Targeted immunosuppressants of some drugs may affect the patient's sensitivity to the immune response of tumor cells, thus affecting the effectiveness of treatment. On the basis of the above research, in the future, a new model of molecular targeted booting can be gradually formed to further study the characteristics of different types of genes.

References

[1] Shuang Guo, Yuwei Liu, Yue Sun, Hanxiao Zhou, Yue Gao, Peng Wang, Hui Zhi, Yakun Zhang, Jing Gan, Shangwei Ning:Metabolic-Related Gene Prognostic Index for Predicting Prognosis, Immunotherapy Response, and Candidate Drugs in Ovarian Cancer. J. Chem. Inf. Model. 64(3): 1066-1080 (2024).

[2] Khalil M, Abbass M A. Neoadjuvant immunotherapy in microsatellite unstable colorectal cancer: Are we in the era of nonoperative management? [J].Journal of Surgical Oncology. 127(8):1296-1299(2023).

[3] Yunfang Wei, Yingzhen Su: Using machine learning and RNA to enhance the efficacy of anti-tumor immunotherapy. Evol. Intell. 16(5): 1555-1563 (2023).

[4] Qiong Wu, Jun Wang, Zongqiong Sun, Lei Xiao, Wenhao Ying, Jun Shi: Immunotherapy Efficacy Prediction for Non-Small Cell Lung Cancer Using Multi-View Adaptive Weighted Graph Convolutional Networks. IEEE J. Biomed. Health Informatics 27(11): 5564-5575 (2023).

[5] Gulnur Ungan, Anne-Flore Lavandier, Jacques Rouanet, Constance Hordonneau, Benoit Chauveau, Bruno Pereira, Louis Boyer, Jean-Marc Garcier, Sandrine Mansard, Adrien Bartoli, Beno ît Magnin: Metastatic melanoma treated by immunotherapy: discovering prognostic markers from radiomics analysis of pretreatment CT with feature selection and classification. Int. J. Comput. Assist. Radiol. Surg. 17(10): 1867-1877 (2022).

[6] Levente Kovács, Tamás Ferenci, Balázs Gombos, András Füredi, Imre J. Rudas, Gergely Szakács, Dániel András Drexler:Positive Impulsive Control of Tumor Therapy - A Cyber-Medical Approach. IEEE Trans. Syst. Man Cybern. Syst. 54(1): 597-608 (2024).
[7] Yuyue Zhang, Liqi Xie, Yueping Dong, Jicai Huang, Shigui Ruan, Yasuhiro Takeuchi:Bifurcation Analysis in a Tumor-Immune System Interaction Model with Dendritic Cell Therapy and Immune Response Delay. SIAM J. Appl. Math. 83(5): 1892-1914 (2023).
[8] Asghar Mesbahi, Maryam Sadeghian, Aisan Mesbahi, Henry M. Smilowitz, James F. Hainfeld: In silico analysis of optimum photon energy spectra and beam parameters for iodine nanoparticle-aided orthovoltage radiation therapy of brain tumors. Simul. 99(6): 539-552 (2023).
[9] Márton György Almásy, András Hörömpo, Dániel Kiss, Gábor Kertész:A review on modeling tumor dynamics and agent reward functions in reinforcement learning based therapy optimization. J. Intell. Fuzzy Syst. 43(6): 6939-6946 (2022).
[10] Ahad Mohammadi, Leonardo Bianchi, Sanzhar Korganbayev, Martina De Landro, Paola Saccomandi: Thermomechanical Modeling of Laser Ablation Therapy of Tumors: Sensitivity Analysis and Optimization of Influential Variables. IEEE Trans. Biomed. Eng. 69(1): 302-313 (2022).
[11] Runze Wang, Zehua Zhang, Yueqin Zhang, Zhongyuan Jiang, Shilin Sun, Guixiang Ma: MolHF : Molecular Heterogeneous Attributes Fusion for Drug-Target Affinity Prediction on Heterogeneity. IEICE Trans. Inf. Syst. 106(5): 697-706 (2023).
[12] Yazdan Maghsoud, Vindi M. Jayasinghe-Arachchige, Pratibha Kumari, G. Andrés Cisneros, Jin Liu:Leveraging QM/MM and Molecular Dynamics Simulations to Decipher the Reaction Mechanism of the Cas9 HNH Domain to Investigate Off-Target Effects. J. Chem. Inf. Model. 63(21): 6834-6850 (2023).
[13] Qichang Zhao, Guihua Duan, Haochen Zhao, Kai Zheng, Yaohang Li, Jianxin Wang:GIFDTI: Prediction of Drug-Target Interactions Based on Global Molecular and Intermolecular Interaction Representation Learning. IEEE ACM Trans. Comput. Biol. Bioinform. 20(3): 1943-1952 (2023).
[14] Xu Bao, Qingfeng Shen, Yanfei Zhu, Wence Zhang: Relative Localization for Silent Absorbing Target in Diffusive Molecular Communication System. IEEE Internet Things J. 9(7): 5009-5018 (2022).
[15] Kexin Huang, Cao Xiao, Lucas M. Glass, Jimeng Sun: MolTrans: Molecular Interaction Transformer for drug-target interaction prediction. Bioinform. 37(6): 830-836 (2021).
[16] Bhanu Sharma: Pharmacokinetic and molecular docking studies of natural plant compounds of Hibiscus sabdariffa to design antihypertensive compounds targeting AT2R. Int. J. Comput. Biol. Drug Des. 14(1): 32-42 (2021).
[17] Elif Onur, Tuba Denkçeken: Integrative analysis of molecular genetic targets and pathways in colorectal cancer through screening large-scale microarray data. Int. J. Data Min. Bioinform. 26(1/2): 81-98 (2021).
[18] John Barrow, William Hurst, Joakim Edman, Natasja Ariesen, Caspar Krampe: Virtual reality for biochemistry education: the cellular factory. Educ. Inf. Technol. 29(2): 1647-1672 (2024).
[19] Mohammed S. Elbasheir, Rashid A. Saeed, Salaheldin Edam: Electromagnetic field exposure boundary analysis at the near field for multi-technology cellular base station site. IET Commun. 18(1): 11-27 (2024).
[20] Nishattasnim Liza, Daniel J. Coe, Yuhui Lu, Enrique P. Blair: Ab initio studies of counterion effects in molecular quantum-dot cellular automata. J. Comput. Chem. 45(7): 392-404 (2024).