Polarisation of tumour-associated macrophages in ovarian cancer

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Ovarian cancer (OC) is one of the top 10 most common cancers among women, which poses a serious threat to women's health due to its late detection, high recurrence rate and other problems. Surgery and chemotherapy are the conventional treatment methods for OC, but the prognosis of these therapies is difficult to meet the ideal requirements. Thus, there is an urgent need for the novel treatment methods of OC. The tumour microenvironment (TME) is a complex dynamic environment composed of multiple components, including immune cells, tumour blood vessels, fibroblasts, extracellular matrix, etc. TME is considered a key factor in promoting cancer progression, drug resistance, and treatment failure. Macrophages in the TME are referred to as tumour-associated macrophages (TAMs), which exhibit high plasticity and play an important role in tumour immune regulation, also in OC. Macrophages could polarise into M1-type and M2-type under different stimuli, while TAMs are considered M2-like macrophages, promoting tumour invasion, metastasis, immune suppression, etc. M2 macrophages in cancer are narrowly even defined as 'TAMs'. TAMs could be reprogrammed from M2-like into M1-like, inhibiting tumour growth. Therefore, targeting M2-like TAMs in tumour tissues has become one of the main strategies in the present tumour immunotherapy. In the present review, we comprehensively focus on the importance of macrophages in OC and discuss the roles of M2-like TAMs in the occurrence, invasion, metastasis and drug resistance of OC. In addition, we summarise the relevant research on anti-tumour strategies targeting TAMs as well as the present status of drug development in recent years, aiming to provide better ideas and strategies for the treatment of OC to improve patient prognosis and survival.

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In this century, cancer is the leading cause of premature death in most countries, going to surpass cardiovascular disease[1], and ovarian cancer (OC) is one of the top 10 worldwide diagnosed cancers in women[2]. It has been reported that approximately 200,000 women die from OC every year[3]. The reason for the high mortality rate in OC is that the ovaries are deeply located in the pelvis, which makes it difficult to detect early[4]. Despite significant development in treatments such as surgical resection, chemotherapy, radiotherapy and immunotherapy, the rapid proliferation and spread in the abdominal cavity, along with a high rate of intra-abdominal recurrence, result in a poor prognosis of OC patients[5]. Moreover, the clinical manifestations of OC are heterogeneous, which influences OC prognosis in various factors such as tumour staging, grading and histological subtypes[6].

The tumour microenvironment (TME) is a complex dynamic environment composed of interactions between tumour cells, stromal cells, epithelial cells, fibroblasts and kinds of immune cells, including T cells, dendritic cells and macrophages[6–8], which is necessary for OC. Previous studies have shown that tumour proliferation and invasion are mediated by multiple mechanisms, including immune cells in TME[9,10]. Tumour-associated macrophages (TAMs) are the main immune cells present in the ovarian TME, which have high plasticity[11], and their crosstalk with tumour cells in the TME could significantly influence tumour progression[12]. Macrophages could polarise into classically M1 macrophages activated via IFN-g/LPS and alternatively M2 macrophages activated via IL-4/IL-10/IL-13 (ref. 13).