A principle hallmark of all cells is the ability to adapt and sense their environment in order to survive in a constantly changing environment. Part of this adaptation in most of organisms needs being able to transition quickly between catabolic and anabolic states based on the nutrients availability. This tolerates lets a cell to keep away from death during times of nutrient depletion by consumption dropping along with allowing a cell to proliferate by consumption increasing once nutrients are abundant and growth is beneficial to the organism. A kinase complex called mTORC1 is considered one of the main mechanisms for many organisms to rely on to mediate this transition. This pathway is sensitive to various aspects of the environment cellular, and subsequently adjust the cell metabolism to meet the organism needs and environment (figure1). The mammalian target of rapamycin (mTOR) kinase is the catalytic subunit of two functionally distinct complexes, mTORC1 and mTORC2, that promote growth of cell, proliferation, and survival. mTOR regulates protein translation through effector molecules S6K1 and 4E-BP1. These two complexes differ in their function, components, regulation, and sensitivity towards rapamycin (figure 2). The mechanistic target of Rapamycin, was named after a natural product isolated in the 1964 from a bacteria from the island of Rapa Nui in South Pacific. Rapamycin forms a complex with a protein now known as FKBP12, and that the Rapamycin-FKBP12 complex in yeast binds two homologues of a protein named TOR (target of Rapamycin), or to one ortholog of the TOR genes in mammalian cells, which was initially named the mammalian target of Rapamycin (mTOR). This complex able to inhibit signal transduction pathways that required for cell growth and proliferation. The dysregulation of mTOR pathway is implicated in an increasing number of diseases, including cancer. This pathway is often over-activated to meet the nutritional needs of the rapidly growing tumour cells. The mTOR pathway is implicated not only in tumorigenesis but also in tumour sensitivity to chemotherapy.
Targeting the mTOR pathway in cancer including mTOR inhibitors that can be broadly grouped into two classes consist of the allosteric inhibitors of mTORC1 (rapamycin and rapalogs) and mTOR kinase inhibitors. However, the mTOR kinase inhibitors drawback with as with rapalogs is that the mTORC1 feedback loop can be relieved which leads to activation of PI3K or MAP kinase signaling, leading to discover of dual PI3K/mTOR Inhibitors. It was found that these molecules inhibit mTORC1, mTORC2, and PI3K, thus inhibiting the phosphorylation of AKT, S6K1, and 4E-BP1, because of the high homology that is shared by the kinase domains of PI3K and mTOR and are considered therefore attractive drugs for targeting cancers driven by PI3K activation. Abroad inhibition of cellular signalling by using dual PI3K/mTOR Inhibitors may also impair growth of normal cells.

Figure 2: Growth factors, amino acids, energy status, and oxygen levels regulate mTORC1, while mTORC2 can be only stimulated by growth factors. mTORC1 encourages cell growth processes including protein synthesis, lipid synthesis, nucleotide biosynthesis, and inhibition of autophagy. mTORC2 regulates cell survival and cytoskeletal reorganization.
Figure 1: The mTORC proteins components. Both mTORC1 and mTORC2 form dimers of mTOR which contain mLST8. mTORC2 additionally contains Rictor and SIN1, while mTORC1 contains Raptor. Further endogenous proteins that interact with the complexes and regulate the actions of mTOR include DEPTOR, PRAS40, and PROTOR. DEPTOR inhibits both complexes, PRAS40 inhibits mTORC1 but not mTORC2, and PROTOR activates mTORC2 but not mTORC1. Treatment of cancer cells with Rapamycin, forming the Rapamycin FKBP12 complex, leading to inhibit mTORC1, while rapamycin effects on mTORC2 are only observed following longer term treatment.
In organizing the proliferation and survival of cancer cells, the ability to adapt and sense the environment is crucial. In situations of cell death and building, depending on the availability of nutrients, cells can survive and distance themselves from death through a decrease in the availability of essential nutrients through reduced consumption and allowing the cell to replicate through increased consumption under conditions of nutrient availability.

This ability is considered important for organisms and the mTOR pathway, as it allows organisms to provide the ability to adapt and grow. The mTOR pathway is sensitive to various external and internal effects, leading to changes in cell function according to the organism's needs (Figure 1).

The mTOR pathway consists of two parts, mTORC1 and mTORC2, which play a role in stimulating cell growth and replication, as well as resistance or survival. It also plays a role in the production of proteins through the activation of basic units, such as S6K1 and 4E-BP1.

These two complexes differ in their functions and components and are sensitive to the rapamycins, Rapamycin (Figure 2).

Rapamycins are complex proteins that have been found to be effective in fighting infections and preventing cell replication. The name of this pathway is based on the natural compound obtained from a strain of yeast Rapo novo, which is known for its immunosuppressant and antitumor properties.

This name was given to the complex FKBP12-Rapamycin, the natural compound obtained from a strain of yeast Rapo novo, which is known for its immunosuppressant and antitumor properties.
الازمه لتحفيز المسار وبالتالي يوفر تمنع نمو وتكرار الخلايا. يساهم في احداث خلل في وظائف الخلايا الذي يقود الى الاصابه بالاضطراب مسار mTOR بالامراض وكذلك الورم السرطانية ربما يقودايسا الى زيادة مقاومة العلاج الكيميائي للأمراض السرطانية.

الاضطراب مسار mTOR يساهم فً احداث خلل فً وظائف الخلٌة الذي ٌقود الى الاصابه بالأمراض وكذلك الأمراض السرطانية ربما ٌقوداٌضا الى زيادة مقاومة العلاج الكيميائي للأمراض السرطانية.

تتم من خلال خلال mTOR C1 والذي يعتبر الاهام في من مسار mTORC2 استخدام المثبطات التي تعمل على استهداف تحفيز مسار mTORC1.

ان أحد العوام في استخدام مسار mTORC1 مثرك الريماسفسين مثل مركب الرٌباماٌسٌن 4E-BP1 و S6K1 يؤخذ على استخدام هذه المثبطات هو احتماليه التثبيط الواسع والشامل لكل المسارات التي من الممكن ان تتداخل ب تحفيز مسار mTORC1.

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