Introduction

2, 4-thiazolidinediones are the derivatives of thiazoline with carbonyl group in the 4-position. Substituent in the 2-, 3-, and 5-, may be varied but the group attached to the carbon atom in the 2nd position exerts the difference in the structure and properties. The first 4-thiazolidinone to be reported was 2, 4-thiazolidinedione, oxygen present at the 2nd position. 2, 4-thiazolidinedione that is frequently called as “Senfolessigsaura” in the early German literature.[1]

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\begin{align*}
\text{HN} & \quad \text{CO} \\
\text{XC} & \quad \text{S} \quad \text{CH}_2 \\
X= O \quad & \text{(2,4-thiazolidinedione)} \\
X= S \quad & \text{(2-thione-4-thiazolidinone)} \\
X= NR \quad & \text{(Psuedothiohydantion)} \\
X= NN=CRR' \quad & \text{(4-oxo-2-thiazolin-2-ylhydrazo of the aldehyde or ketone)}
\end{align*}
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Microwave induced organic reactions have emerged as a new ‘Lead’ in organic synthesis. The microwave enhanced chemical reactions are gaining importance due to the advantages and environmentally friendly processes they offer, as compared to conventional reaction. Conventional methods of organic synthesis usually need longer heating time, elaborate and tedious procedures which result in higher cost of process and the excessive use of solvents, reagents leads to environmental pollution. Pharmaceutical chemistry laboratories use large quantities of toxic chemicals and solvents to perform reactions exposing laboratory persons including students and environment to related hazards. Review literature states that in a majority of cases the cause for the observed rate increase is a purely thermal/kinetic effect. It is a result of the high reaction temperature that is quickly attained when irradiation of polar materials is done in a microwave field. The microwave energy reduces the heat-up and cool-down time for reactions. It uses 50% less power than electric furnaces of equivalent capacity. [2]

Diabetes is a life-long disease for which there is not yet a cure. Diabetes mellitus, long considered a disease of minor significance to world health, is now taking its place as is one of the
main threats to human health in the 21st century. The incidence of the disease currently is estimated to reach 210 million by the year 2010 and 300 million by the year 2025.\(^1\) Most cases will be of type 2 diabetes, which is strongly associated with a sedentary lifestyle and obesity. The term diabetes was coined by Aretaeus of Cappadocia. The Greek word *diabainein* literally means “siphon”, or “passing through”, a reference to one of diabetes’ major symptoms—excessive urine production. The word "diabetes" became from the English adoption of the Medieval Latin *diabetes*. In 1675 Thomas Willis added *mellitus* from the Greek word for honey (*Mel* in the sense of "honey sweet") when he noted that a person with diabetes's urine and blood has a sweet taste. This had been noticed long before in ancient times by the Greeks, Chinese, Egyptians, and Indians. In 1776 it was confirmed the sweet taste was because of an excess of a kind of sugar in the urine and blood of people with diabetes.

The medication class of thiazolidinediones (also called as glitazones) was introduced in late 1990’s as an adjunctive therapy for type 2 diabetes mellitus and related disease. In the course of investigation of fibrates class of hypolipidemic agents at Takeda, a series of 5-(4-alkoxybenzyl)-2, 4 thiazolidinediones were shown to reduce insulin resistance in genetically diabetic and obese animals. Ciglitazone, which became the prototype of this class, was synthesized in 1982. Ciglitazone was taken into human trials in NIDDM subjects, but was withdrawn because of low potency and appearance of cataracts in animals receiving long-term exposure to the drug. Following extensive testing of numerous hindered compounds of numerous hindered phenolic compounds, several other agents were developed, including pioglitazone, Trioglitazone, engiglitazone and BRL 49653. In January 1997 the first thiazolidinedione, Trioglitazone was approved, as glucose lowering therapy for patients in US with type 2 diabetes. Clinical developments of most of these compounds have not been progressed because of their unacceptable side effect profile. Therefore, Trioglitazone was subsequently withdrawn from the market in March 2000, because of hepatotoxicity. Two currently available PPAR\(\gamma\) agonists, rosigliatzone (AVANDIA) and pioglitazone (ACTOS) was approved in 1999 in US.
Mechanism of action of thiazolidinediones: -

Molecular mechanism of biological response of thiazolidinediones

Peroxisome proliferators activated receptor γ (PPARγ) is a transcription factor activated by thiazolidinediones (TZDs). In transactivation, which is DNA-dependent, PPARγ forms a heterodimer with the retinoid X receptor (RXR) and recognizes specific DNA response elements called DNA response elements (PPRE) in the promoter region of target genes. This results ultimately in the transcription of PPARγ target genes. After ligand binding, PPARs undergo conformational changes, which lead to recruitment of cofactor proteins and co-activators. The co-activator interacts with nuclear receptor in a ligand-dependent way and influences the set of genes transcribed. In transrepression, PPARs can repress gene transcription by negatively interfering with other signal-transduction pathways, such as the nuclear factor-κB (NF-κB) signaling pathway, in a DNA binding-independent manner.

An anti-microbial is a substance that kills or inhibits the growth of microorganisms such as bacteria, fungi, or protozoans. Antimicrobial drugs either prevent the growth of microbes (microbiostatic) or kill microbes (microbiocidal). Pasteur and Joubert has discovered that one type of bacteria could prevent the growth of another. They did not know at that time that the reason one bacterium failed to grow was that the other bacterium was producing an antibiotic. Technically, antibiotics are only those substances that are produced by one microorganism that kill, or prevent the growth, of another microorganism. Of course, in today's common usage, the
A term antibiotic is used to refer to almost any drug that attempts to rid your body of a bacterial infection. Antimicrobials include not just antibiotics, but synthetically formed compounds as well.

There are several ways of killing the microorganisms such as sterilization, pasteurization by using high temperature, UV light, high pressure, steam chemicals etc. However, when the pathogenic microbe is inside the human body none of these methods are feasible except using antimicrobial chemotherapeutic agents that include antibiotics (of microbial origin) and artificially synthesized compounds (drugs).

An antioxidant is a compound or substance that is capable of inhibiting the oxidation of other substances. Oxidation is an electrochemical reaction that transfers electrons or hydrogen from a substance to an oxidizing agent. Free radicals can be produced by oxidation reaction. In turn, these radicals can start chain reactions. Death of the cells can be caused by Chain reaction. These chain reactions are terminated by antioxidants by inhibit other oxidation reactions and by removing free radical intermediates. Antioxidants are often reducing agents, because they oxidized themselves.