Herein is given an account of the cytogenetical investigations carried out on mammals like the mice, rats or guinea-pigs treated with certain drugs or chemicals. The agents studied include caffeine, papaverine, atropine, emetine, barbitone, ethylalcohol, morphine, heparine, mitomycin C, chloramphenicol, chlordiazepoxide, diazepam, alloxan, benzene, benzidine, phenylthiourea, EDTA, hydrazine, phenylhydrazine and hydroxylamine. Specific route was in practice for a particular agent. Some of them were introduced either intraperitoneally or abdominally, whereas the others were given orally. A few of them were intravenously injected.
In order to pinpoint the anomalies, the chromosomes of treated animals were compared with those of controlled ones. Besides, an attempt has been made to standardize the karyotypes of the 3 animals used during the present observations on the basis of Giemsa banding pattern produced by applying various techniques.

Not even a single chemical was found to be free from mutagenic nature, although some showed exclusively a minor effect. At the same time, the others revealed an extremely high effect i.e., pulverization of the genetic material which makes the cell to leave the clone. The type of abnormality and the tissue used of the animals has been summarized in Table-XIV. The -ve sign represents the absence of a particular type of anomaly. The maximum effect has been seen with mitomycin C which showed aneuploid cells at a climax amongst the numerical abnormalities. Next comes papaverine which also yielded both the types of aberrations i.e., numerical and structural. Although the aneuploid cells were formed, they were much less than those with mitomycin C. The structural anomalies included gaps, breaks, exchange figures, fragmentation, pulverization etc. However, there were certain agents which produced only a particular type of effect e.g., papaverine was characteristic in yielding pulverized chromosomes, whereas caffeine produced vacuolization.

Some of the agents caused common effects e.g., the
Effect of alloxan was similar to barbitone. Both of them resulted in numerical as well as structural variations. The numerical ones included both the aneuploid and polyploid cells. Amongst the common structural anomalies produced were the gaps, breaks, exchange figures, fragmented and pulverized chromosomes. Other effects were chromatid disjunction and endoreduplication. Similarly EDTA and benzene were similar to some extent as regards the effect on the chromosomes.

The frequency of the sum total of the aberrations produced by phenylhydrazine was quite less. Minimal effect was produced by emetine and ethyl alcohol.

Another interesting feature was that if a second chemical is given after the first had been injected - the cumulative effects were seen. This has been seen with atropine sulfate followed by treatment of barbitone, phenyl thiourea and quinidine sulfate.

Heparin, a commonly used anticoagulant, causes disruption of the genetic material even if a slightly higher dose is given. It, therefore, makes one believe that a slightly higher dose can manoeuvre with the genetic material of the organism and cause mutations.

From the observations made during the present investigations, one is forced to believe certain points that even if caffeine - which is present in commonly used beverages, is hazardous to chromosomes, then what to say about the other drugs and chemicals. It is, therefore, suggested that there must be a regularized use of the drugs and chemicals.
Another point is that even the structurally divergent chemicals can produce similar effects. So there is not much relationship between the molecular identity or interaction of the agent and the structure of the genetic material.

Furthermore, it is presumed that the chemicals and drugs are no doubt useful in day to day life, but a small nonunderstandable use can play with our genetic make up. A slight deviation can cause gaps — which in turn result in breaks. Once this has happened, the interaction starts resulting in multiple effects which go on increasing and ultimately what we get is a pulverized cell which is generally forced to leave the clone.

What is most interesting is not the effect but the consequences. It is known that even a single gene mutation is disastrous for life. But it depends upon its type i.e., whether it is balanced or lethal. Lethal mutations will kill the cell and eliminate the cell from the clone. However, in other mutation even if it is balanced it may alter the functioning of the other genes which in turn alter the whole cell metabolism and cause various mutations on the chromosomes such as gaps — breaks — fragmentation — supernumeraries — pulverization — detriment of the nuclear material — death of the cell.
Now the question arises as to what is the use of such studies? It has been seen that a gap in the particular region pinpoints the genes, thus affected and so we can map the chromosomes in this region e.g., barbitone induces terminal breaks; caffeine causes random gaps and breaks, but with a different mechanism i.e., not after the vacuole formation. Such mechanism has been seen with any other chemical. So this is a specific action of this particular agent.

While concluding it becomes necessary to point out that in this developing world of atomic and molecular age, there is a possible fear that our future generations may not be normal genetically. Why? The cause is probably the excessive mutations. So why cannot we caution ourselves? The experiments are done only to make us aware of all these. It is, therefore, advised that only when it is unavoidable, the drugs be used and before their introduction into the market, they must be tested for genetic manoeuvres. The industrial workers must be provided with chemical entrance inhibiting guards.