

FUTURE DRUGS: A RESEARCH REVIEW

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-ABSTRACT-

In universities, in government and private research laboratories and in our national pharmaceutical companies, the search for new drugs never ends. Chemists synthesize new compounds and submit them for pharmacological testing. Pharmacognosists search the plant world, hoping to find new leads from folk medicine. And biochemists and physiologists look to the human body itself for new therapeutic agents.

Drug testing in sports has become a highly sophisticated and reliable procedure. The use of gas chromatography / mass spectrometry has made the detection of doping substances, even in very minute levels in urine samples “easily” detectable.

In this brief review the researcher has tried to details of the research and development of several new drugs which are used in sports. It should be apparent that the process can be long, difficult, and expensive, requiring persistence and hard work over a period of years. However, to the bone-cancer victim, to the hepatitis sufferer, and to the infected-eye patient, it all seems very worthwhile, indeed. Sports society owes a great debt to the men and women who persist and who turn the drugs of the future into the drugs of today.

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The last-mentioned source, the human body, has already given up many of its secrets, from which mankind has gotten the idea for highly useful therapeutic agents. Consider the following discoveries of naturally occurring body substances and how researchers have capitalized on them:

1. The discovery of catecholamine's (epinephrine and norepinephrine) has led to the synthesis of many active analogues, such as the amphetamines.
2. Knowledge of the neurotransmitter substance acetylcholine and of the enzyme acetyl cholinesterase has stimulated the discovery of potent insecticides.
3. Knowledge of the monoamine oxidizes has led to antidepressant drugs.
4. Dopamine's presence in the brain was the stimulus for finding a treatment of Parkinson's disease.
5. Progesterone, the body's naturally occurring anovulatory agent, led to the discovery of oral contraceptives.
6. Carbonic anhydrate, occurring naturally in the lungs, gave us the idea of inhibitors that act as potent diuretics.
7. The brain's natural pain relievers, endorphin and enkephalin, are the seeds for fruitful research in synthetic analgesics.
8. Our knowledge of histamine and its release in the body permits us to design and synthesize antihistamine agents.

9. Sex hormones, such as the estrogens, have set the stage for synthetic analogues.
10. The finding of anti-inflammatory steroidal hormones opened the door to dozens of active, synthetic congeners.
11. The kidney's natural blood pressure regulator, angiotensin, has become the model for man-made analogues.
12. A knowledge of the occurrence and function of insulin assisted successful introduction of the oral anti-diabetics.

We wonder what secret body chemicals are yet to be discovered and to what use will we put them? I will predict that major discoveries will be made in the area of receptor-site theory, where researchers will find new, natural body chemicals by the technique of isolating their receptor sites. Already a naturally occurring valium like ant anxiety agent has been found by this strategy.

Here the researcher is going to put two more secrets which were locked up in the human body all of these millennia, but which are now known and ready for therapeutic exploitation. Prostaglandin research and application is further along than that on interferon, but both discoveries hold great promise. Indeed, the research that has gone into the discovery and development of these two new agents is already paying therapeutic dividends.

Possible future applications: the E-prostaglandins inhibit gastric secretion. As more is discovered about this effect, it is anticipated that products will become available for treating or preventing gastric ulcer. Volunteer sunburn victims have been treated with a compound that inhibits the synthesis of prostaglandins. Wherever the inhibitor was applied to burned skin, redness and temperature were diminished and pain was reduced with the outdoor sportsman.

There is reason to believe that the prostaglandins are closely connected to urine formation and the loss of sodium ion, both of which can influence blood pressure. Thus hypertensive patients might benefit from the proper administration of exogenous prostaglandins.

High hopes for interferon:

More than 100 million people in the world are chronically infected with hepatitis B virus, a pathogen that damages the liver. This virus is the culprit that causes hepatitis in persons who received transfusion with blood contaminated by the pathogen. Good results have been achieved in the initial clinical trials of interferon in hepatitis B infections, prompting further studies in sports field.

OBSTACLES:

Useful new drugs seldom come easily, and interferon is no exception. Before interferon can become a widely used therapeutic agent, it will have to prove itself effective and safe in the human and will have to meet all of the requirements for FDA approval mentioned. This could easily take another five years, or more. Manufacturers will have to find ways of overcoming its short supply, a factor that is currently restricting research efforts. Interferon is unusually difficult to prepare and purify and is accordingly very expensive.

One discouraging side effect of the use of interferon has been noted. When given to a human, interferon suppresses the bone marrow and the lymph cells, thus threatening the person's immune response. At this time, it isn't clear if this effect is caused by the interferon itself or by impurities in the interferon preparations. But it probably is the former.

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The lack of objective and consistent information regarding effects of drugs and ergogenic aids is in part attributable to individual physiological and psychological variations among people. In order to deal with possible psychological effects, a placebo (an inert substance with the identical physical characteristics of a real drug) is used in the research design.

Nutrition aids in the form of glycogen super-compensation can enhance endurance performance by providing larger initial glycogen stores in muscle, thus delaying the onset of fatigue. The intake of supplemental vitamins generally has no benefit for the athlete and is harmless, except in some instances where mega-doses of vitamins might be ingested. Maintaining water and electrolyte balance is essential to normal performance.

It is now evident that anabolic androgenic steroids can be effective in increasing body mass and strength. However, the potential dangers and risks of taking steroids are well documented. There are inherent dangers for both male and female uses of this class of drugs. Human growth hormone has been used alone and in combination with steroids. This represents a further heightening of risk to the health of an individual. The intake of steroids and growth hormone for the sole purpose of improving physique and athletic performance is ill advised.

Among physiological agents, blood doping represents a major concern. Because of both ethical and clinical reasons, blood doping is not recommended. The practice has been banned in national and international competition. Oxygen can have short-term benefits if breathed prior to breath-holding activities. Otherwise, supplemental oxygen is ineffective.

Oral ingestion of aspartic acid salts does not consistently result in increased exercise performance. However, the ingestion of alkaline salts (sodium bicarbonate) appears to increase endurance during heavy, short-term exercise. Caffeine has been shown to increase significantly the amount of work performance before fatiguing.

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