New lead in muscular dystrophy research

MONASH biochemists have identified what they believe could be the primary metabolic defect involved in the devastating wasting disease, Duchenne muscular dystrophy.

The disease, which is inevitably fatal, affects only boys and is inherited as a sex-linked recessive trait. The incidence is about one case in 3000 to 4000 births.

The Monash team, Dr Lawrie Austin, Dr Peter Jeffrey, Dr Helen Arthur and professional officer Michael de Niese have "strong circumstantial evidence" that the primary defect is a defective plasma lipoprotein component.

The protein, known as Apoprotein B, normally takes up Vitamin E and transports it to the tissues.

If the transport system is defective, as appears to be the case in Duchenne muscular dystrophy, the muscle membranes are deprived of Vitamin E, which is essential for their proper functioning.

"If the membranes are not functioning properly," Austin says, "there may be many consequences, including a leakage of calcium, and this in turn can lead either to excessive muscle breakdown, or to an inefficient repair mechanism."

Although the Monash findings have no immediate therapeutic application, Austin says, they could lead to improved methods of screening for carriers of the disease and, more importantly, to some way of controlling the disease by supplying the affected tissues with Vitamin E.

Attempts were made some years ago, he says, to treat Duchenne muscular dystrophy patients with massive doses of Vitamin E, but the trials were unsuccessful.

"If we are correct, the reason for the failure of Vitamin E treatment is obvious," he says. "The Vitamin E could not be delivered to the muscle membranes because of the defective transport system."

The Monash finding was made during a study into the way in which membranes are maintained in a healthy state.

Arthur was studying lipoprotein blood fractions from muscular dystrophy patients, carriers of the disease, and controls (people who neither had the disease, nor were carriers of it). The lipoprotein fractions have a distinctive colour which can be seen when they are separated by centrifugation from blood samples. The colour is due partly to substances called carotenoids, and partly to Vitamin E, which the lipoproteins transport to tissue membranes.

When examining the lipoprotein fractions she noticed that the colour of one lipoprotein band (low density lipoprotein) was much less intense in Duchenne patients than in controls. In the Duchenne patients it was only a third to a half of that in controls. In the case of carriers it was greater than in muscular dystrophy patients but significantly less than in controls.

Pregnancy from frozen embryo

A Monash led team at the Epworth Hospital and Queen Victoria Medical Centre has achieved the first in vitro pregnancy from a frozen human embryo. Details: Page 5.
Muscular dystrophy  
Continued from Page 1

The low density lipoprotein (LDL) fraction is one of the major carriers of Vitamin E. The key to its transport is a particular protein in the fraction called Apoprotein B.

Subsequent tests of red blood cell membranes from Duchenne patients and controls (12 age-matched subjects in each group) showed that the Vitamin E content of the muscular dystrophy patient membranes was significantly lower than in the controls.

"It is circumstantial evidence," Austin admits. "But it is strong circumstantial evidence.

"We have studied the blood of eight cancer patients with muscle wastage, and it appears normal. The muscle wastage seen in dystrophy patients does not appear to be a cause of the lowered levels of lipoprotein and Vitamin E. It seems to be the other way around.

"But we need to look at other muscle wastage diseases, including other less severe types of muscular dystrophy before we can be sure."

Austin says the Monash finding, if correct, could lead to better methods of carrier detection. Present methods are only about 60 to 70 per cent effective.

However, screening for carriers of Duchenne muscular dystrophy is of limited value because of the high incidence of mutations. In about one third of cases of Duchenne muscular dystrophy there is no family history of the disease. It is the result of a mutation.

Austin believes the best hope is in developing some way to supply the muscle membranes with Vitamin E, or some analogue of the vitamin.

"If we can do that," he says, "we may be able to alleviate the symptoms, and, perhaps, halt the progress of muscle degradation."

Results of the research have been published in the journal, Biochemistry International, and further reports are in press.

The research is funded by an NH & MRC grant and the Victorian Muscular Dystrophy Association.

Dr John Maloney (inset) the miniature radio transmitter.

World first in foetal monitoring

AN international team of medical researchers headed by Dr John Maloney, director of Monash University's Centre for Early Human Development at the Queen Victoria Medical Centre, has achieved a world first in foetal monitoring.

Using a specially-designed radio transmitter surgically implanted in the foetus before birth, they have successfully followed the entire birth process of a lamb from foetal stage to birth.

They were able to gather information on heartbeat and breathing patterns of the foetus from six weeks before birth, through labour, the actual birth and into its new-born life as an infant lamb.

Three lambs were involved in the research which took place at the University of Calgary, Canada, during a recent visit there by Maloney as Herage Visiting Professor.

Collaborating with Maloney in the research were Dr George Carson, of Calgary's department of obstetrics and medical physiology, Peter Hogan, of the Calgary cardiovascular research group, and Dr Jean Claude, of the Stanford University Electronic Laboratories.

The researchers believe a better understanding of the events surrounding birth will enable scientists to establish early warning signals of babies in distress.

About 4000 babies die in Australia in the first year of life. In Victoria, in 1981, 800 babies died in the period extending from the last four months of life in the womb into the first month of life. Furthermore, about 8000 babies were born with major or minor physical or intellectual handicaps.

In about 65 per cent of cases the cause of death is believed to be hypoxia (lack of oxygen). In some cases a child suddenly stops breathing, or an apparently healthy infant is found dead in his cot with nothing to indicate the cause of death. This is usually referred to as "Cot Death".

The causes of hypoxia, sudden stoppage of breathing and "Cot Death" are unknown, as are many other causes of sudden death in infancy.

Maloney hopes that with greater knowledge it will be possible to reduce both the number of infant deaths and the number of babies born with physical disabilities.

Although the information obtained from the Calgary research has yet to be completely analysed by computer, the team reports some interesting preliminary findings.

It confirmed that the foetal lambs use their breathing muscles (although they still receive oxygen only via the mother's placental) at least 10 weeks before birth. The way they use these muscles varies as they grow older in the womb. Until very late in the gestation period they "breathe" for 20 minutes, then stop for 20 minutes.

"Obviously," Maloney says, "the baby lambs must be able to breathe continuously when they are born. How does this come about? When do they gain this ability? These are questions no one has ever tackled before."

Maloney's team also observed foetal brain activity while breathing in the later gestation stage which resembles REM (rapid eye movement) sleep in man, a sleep stage usually associated with dreaming.

Heartbeat also yielded some intriguing clues.

"One lamb which had a breach-birth showed significant slowing down of the heart just before birth," Maloney says.

"Presumably we could detect that slowing even earlier to give us ample warning of the birth abnormality."

Maloney does not envisage the implantation of radio transmitters in human foetuses, but the Calgary research, he says, is the first step in developing techniques to monitor the development of babies in the womb.

The tiny transmitters, which are capable of transmitting up to seven channels of information, were implanted beneath the skin of the foetal lambs and connected to signals from their hearts and breathing muscles. The information was decoded and permanently recorded on magnetic tape and paper for detailed analysis.

The research on lambs will continue at the Queen Victoria unit, which will collate the data gathered in Melbourne and at Calgary.

MAY, 1983
Tracking a nation on the move

AUSTRALIANS move house more often than one would think. And in most cases the change of residence is made within the city in which the person is living at the time of the move.

A study by Monash geographer Dr Chris Maher of 10 Australian cities shows that within the five-year period (1971-76) between 40 and 50 per cent of the population in most of the cities moved to another place of residence.

The figure varied from a low of 37 per cent in Newcastle to a high of 57 per cent in Canberra.

The two major cities, Sydney and Melbourne, both experienced turnover rates of around 43 per cent. Three-quarters of this population change related to moves within the particular city.

Maher’s study, which is being prepared for the Australian Bureau of Statistics, is based on the 1976 Census, which, for the first time, made possible a study of intra-urban mobility.

Among the questions asked in the Census were place of residence one and five years previously. Those who indicated they had moved were assigned to an area of origin in either 1971 or 1975, and an area of destination in 1976.

The data was tabulated according to the Local Government Area, the basic administrative unit within Australian cities. It thus describes flows within and between Local Government Areas in each major metropolitan area in Australia, and is cross-tabulated in a detailed fashion by socio-economic and demographic characteristics of the population.

Maher’s study shows that in the one-year period (1975-76) nearly 17 per cent of Melbourne’s population changed residence, compared, say, to 20 per cent a year in the US and 10 per cent in the UK.

Maher points out that the one-year and five-year figures mask multiple moves.

“It is obvious,” he says, “that if a figure of around 17 per cent mobility is taken as yearly average and at the end of the five-year period fewer than 50 per cent of the population are in a different dwelling, some must be moving more than once.

“These multiple moves are missed by a question relating to a specific base date rather than elicit migration histories, but such information is not available.”

Contrary to popular belief, there is no evidence of a pronounced move back to the inner city.

A relatively small proportion of the population, attracted perhaps by cheaper transport costs and inner-city life, is moving to the inner suburbs. But both the one-year and five-year figures give an “overwhelming impression” of outward movement in Melbourne, Maher says.

There is no evidence of a pronounced move back to the city.

The largest flows in Melbourne, he says, tend to concentrate in the north-western suburbs. For example, he points out that a significant number of moves have taken place in the south-eastern sector from St Kilda to both Caulfield and Moorabbin. At the same time, Caulfield and Moorabbin are losing population outward to Waverley and Springvale, and these in turn are supplying residents to the newest peripheral areas of Knox and Cranbourne.

A similar pattern is observable to the north where population moving to the outer suburbs of Broadmeadows and Whittlesea from the middle ring of Preston, Coburg, and Northcote are being replaced by population from yet further in, suburbs such as Brunswick, Collingwood, Fitzroy and Melbourne.

Maher’s study suggests that the outward moving population is predominantly composed of families with children while the inward movers are young and most often single.

Many of the people moving to the outer suburbs are doing so because of cheaper housing. But there are costs “in terms of isolation, fewer choices of job type and location, and a lack of essential social services.”

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Continued overleaf

MAY, 1983
Monash collaborates in drug research

Dr Chris Maher

Maher believes that despite any slow down in suburban building activity or a trend away from larger families, an outward population movement will always remain important, "even in a steady state city." The trend has important implications for the provisions of amenities and essential social services.

Another problem, which is occurring here as well as in other cities in Australia and overseas, is "gentrification" — a process where lower income, lesser skilled and/or educated residents are replaced or displaced by groups of a higher socio-economic status. This appears to be occurring in the Melbourne inner-city areas of Collingwood, Fitzroy, Richmond and South Melbourne.

'Gentrification' appears to be occurring in some inner city areas.'

In 1961, residents in white collar occupations made up 35 per cent of Melbourne's inner-city population, but by 1976 this had increased to 45 per cent.

"If the inner city market continues to become the preserve of the affluent seeking a cosmopolitan and varied environment," Maher says, "the groups who have traditionally used these areas — the recent immigrants, the unemployed, the welfare recipients, or even the unskilled workforce — will be increasingly forced into the outer suburbs, further from public transport, jobs, and support facilities.

"The plight of these groups can only be understood in the context of the operation of the whole housing system and the distributional effects which it entails."

Maher's study, which will be published by the Australian Bureau of Statistics as a monograph, has already been published in part — as a chapter in the recently published book Social Process In the City, and as a paper in the U.S. journal Urban Geography.

MONASH REVIEW

The powerful new pain-killing drug, buprenorphine was discovered as a sequel to the investigation of a series of potent analgesic compounds, which later became widely used in veterinary medicine. Pictured above is an elephant in the Serengeti Game Reserve recovering after being tranquillised for legging by one of these drugs. Injection of an antagonist restores the animal to normal within 30 seconds.

MONASH pharmacologists are collaborating with a British consultant anaesthetist, Dr. Keith Budd, in a study aimed at overcoming side effects of the powerful new pain-killing drug, buprenorphine which may restrict its use in some patients.

The drug, a compound with a morphine-like chemical structure, developed by the pharmaceutical firm Reckitt and Colman, is a potent, long-lasting analgesic which promises to revolutionise the treatment of severe pain. It can be self-administered sub-lingually (under the tongue), and, unlike morphine and other morphine-type drugs, it is much less likely to produce physical dependence and addiction.

The use of buprenorphine by injection was authorised in the UK four years ago and for the past 16 months it has also been available in Australia on the non-narcotic schedule and approval of the sub-lingual form of the drug is at present being considered by the health authorities in Canberra.

Budd, Director of Pain Relief Services at the Bradford Royal Infirmary, who is at present visiting Monash, says numerous clinical studies in the UK have demonstrated buprenorphine's effectiveness in the treatment of severe pain due to a variety of conditions including that occurring post-operatively and in cancer.

However, as with the narcotic-type drugs, it occasionally causes nausea and vomiting and may slow breathing in some patients. His own extensive trials, however, have shown that it can be safely used even with patients with chronic respiratory disease.

Budd and Monash pharmacologists Dr. Jean Olley and Professor Alan Boura are conducting a series of animal studies in an attempt to overcome the nausea problem. They are developing a model in animals for nausea with the aim of improving, with drugs, the clinical control of buprenorphine-induced nausea. The animal studies will be complemented by human investigations in the UK.

Much of the early research (more than a decade ago) which led to the development of buprenorphine was actually done by Boura and Monash pharmacology laboratory manager, Ian Macfarlane who were then working in the laboratories of Reckitt and Colman in England.

Buprenorphine was discovered as a sequel to the investigation by Boura and Macfarlane of the properties of a series of analgesic compounds of unprecedented potency, known as "M" compounds which had been synthesised in the 1960's by Professor Kenneth Bentley, then chief organic chemist at Reckitt and Colman's. It was Macfarlane who recognised buprenorphine's unusual characteristics in laboratory rats and published the first scientific paper on its effects in animals.

Several of these "M" compounds, some of which are up to 10,000 times more potent than morphine, later became widely used as analgesics and tranquillisers in veterinary medicine, particularly for game conservation purposes.

"Only a milligram of one, called etorphine, was needed to tranquillise and produce analgesia in a two tonne rhinoceros," Boura says. "Because of the drug's high potency, a small amount is only required which can be easily placed in the tip of a dart to be fired into the animal from a safe distance. When the animal is struck by the dart, it comes to a halt. Because it does not feel pain and is in a catatonic state, it can be safely tagged or operated upon if necessary."

The "M" series also contained drugs which reversed the analgesic and catatonic effects of buprenorphine.
effects as well as those which induced these conditions. Injected with one of these antagonists, a tranquilised animal returns to normal within 30 seconds.

Boura and Macfarlane later found that unlike the narcotic pain killers, the "M" series drugs were also effective as analgesics in animals if given sub-lingually.

Although of unprecedented potency, many of the drugs could not be used as analgesics for humans because of the side effects which were identified in animal experiments. The search therefore continued for drugs with at least the potency of morphine but without its addictive properties.

The first clue that it might be possible to find a potent analgesic which did not lead to physical dependence and addiction came from the unexpected finding in the US by Louis Lasagna and Henry Beecher, that the opiate antagonist nalorphine had a powerful analgesic effect in patients. Nalorphine, being an antagonist, precipitates withdrawal symptoms in morphine and heroin addicts and therefore cannot be abused but unfortunately its routine use as an analgesic was prohibited because it produces hallucinations and other undesirable side effects.

"But with the fortuitous discovery of the analgesic properties of nalorphine the race was on for a compound that had this sort of action but which did not cause addiction," Boura says.

Boura and his colleagues examined several hundred compounds in the "M" series, but the major problem was to develop a suitable test for such a drug using animals since the analgesic effect of nalorphine was not revealed by the conventional laboratory tests at that time.

Eventually a test was found, and it led to the discovery by Macfarlane of buprenorphine and its later development as an analgesic by Reckitt and Colman.

Buprenorphine is much more potent than morphine although less so than some of its "M" series relatives used in veterinary medicine. Pain relief in patients with it lasts longer than with morphine and there is much less danger of physical dependence and overdose when self-administered. It has also been found useful for treating heroin and morphine addicts.

The "M" series of compounds may hold yet more surprises and possibly contain even better analgesic compounds. One interesting compound is M320, which is also being studied in the Monash pharmacology department.

Pregnancy success with frozen embryo

A MONASH-LED team at the Epworth Hospital and Queen Victoria Medical Centre has achieved the first pregnancy from a frozen human embryo.

The pregnancy, announced as the Monash Review went to press, is in its 14th week and indications are that the baby is progressing normally.

The feat was achieved by Professor Carl Wood's in vitro fertilisation group centred on Monash University's department of Obstetrics and Gynaecology at the Queen Victoria Medical Centre and Epworth Hospital.

The principal research scientists involved in the frozen embryo program, Dr Alan Trounson and Ms Linda Mohr, have been working on the project for the past three years.

Both the husband and wife and their doctor have expressed the wish to remain anonymous for personal and ethical reasons.

The couple, diagnosed infertile because both of the woman's tubes were blocked, had four eggs collected last year. Three were reimplanted two days after collection. The fourth embryo was frozen a few days after collection.

The patient became pregnant to the initial reimplantation but miscarried at eight weeks. At the couple's request, the frozen embryo was thawed four months after the original collection and implanted during one of the woman's natural ovulatory cycles.

The in vitro team has now thawed more than 20 embryos and re-implanted 13. Ultrasound tests have shown that the successful pregnancy is proceeding normally.

In the freezing process, a solution containing the embryo is cooled from room temperature to minus 80 degrees C, then plunged into liquid nitrogen — taking it to minus 196 deg. C and suspending all metabolic processes.

Monash introduces Ukrainian course

MONASH has introduced the first Ukrainian course at an Australian university.

The course (a three-year minor sequence in the department of Slavic studies) is a co-operative venture between Monash and the Ukrainian community.

The Association of Ukrainians in Victoria has promised $100,000 over the next three years to support the course.

A graduate of the University of Queensland and Monash, Mr Marko Pavlyshyn has been appointed lecturer in the course. Pavlyshyn, who has also taught at the University of Adelaide, is of Ukrainian descent.

Fifteen students have enrolled in the first year of the course. Most are of Ukrainian background and most are completing degree or diploma programs at other tertiary institutions.

There are three components to the new course:

- Ukrainian language at an advanced level;
- An introduction to modern Ukrainian literature, and
- An introduction to East Slavic linguistics.

The Ukrainian community views the introduction of the course at university level as meeting needs relating to the preservation of cultural heritage and identity, welfare and teaching training. Ukrainian is now an accepted HSC subject.

Monash was approached by the Ukrainian community to introduce the course because its department of Slavic studies already offers courses in the related Slavonic languages of Russian, Serbo-Croatian and Polish.

The Monash Main Library also holds the largest collection of Ukrainian monographs on language and literature in an Australian university. Ukrainian is widely taught in European and North American universities.
Seaweeds’ ‘scented’ sex life

PHEROMONES — chemicals secreted by an organism as a means of communication between members of the same species — are well known in insects, fishes and mammals.

Female moths, for example, secrete a volatile sexual attractant which is detected by special receptors on the male’s antennae. However, until fairly recently it was not known that some plants also have pheromones.

Monash botanists, Dr Margaret Clayton and Dr Neil Hallam, are studying the reproductive biology of several species of marine algae as part of their King Island “kelp” program.

With the help of West German colleagues Professor Dieter Mueller, of Konstanz, and Dr Guenter Gassmann, of the Marine Institute, Heligoland, they are studying the pheromones of some Australian species of brown algae.

Clayton, Muller and Gassmann have shown that the eggs of Hormosira (“Neptune’s necklace”), a common brown alga found on the seashore, secrete a chemical which attracts the sperm to the egg. They were able to collect thousands of eggs from Hormosira, extract the chemical they secrete and identify it. It is a relatively simple hydrocarbon.

The same chemical compound is secreted by the eggs of the giant kelp Durvillaea potatorum which is harvested on King Island for its alginates, which are used in the manufacture of foods, cosmetics, detergents, glues, paints, glouting and the like.

Clayton says that, unlike higher plants, Hormosira and Durvillaea reproduce in a way akin to animals. There are male and female plants in both species of algae which produce eggs of comparable size to the human ova and produce motile sperm.

“It’s a bit odd that different species should secrete the same compound to attract sperm,” she says. “This could cause confusion.

“You can smell these chemical compounds,” she adds. “They have a pleasant sweetish odour.”

One technique used to determine whether the hydrocarbon compound was a sperm attractant involved putting a droplet of petroleum jelly containing the chemical into a sperm suspension.

With Hormosira the effect was dramatic. The sperm formed a dense halo around the droplet.

Preliminary tests on Durvillaea sperm, however, have not been as clear-cut. Further investigation will involve microphotography to count the number of sperms in the vicinity of inert droplets containing different concentrations of the compound.

The sperm count should give a clear indication of whether the chemical

The sperm formed a dense halo around the droplet.

“Complicated changes take place in the cytoplasm of the egg at fertilisation and the outer membrane becomes sticky. Very soon, a fibrillar matrix of the adhesive is evident, the zygote lands, and firmly bonds to the rock surface.”

Within 24 hours the dividing zygote produces a filament-like rhizoid (a root-like structure) which also bonds to the rock by the same adhesive. Further cell divisions occur so that by a fortnight the young Durvillaea sporeling looks like a mulberry of cells, and more rhizoids appear at the base. These later amalgamate into a disc-like holdfast which may be up to 20cm in diameter in a mature (6-7 year old) plant.

Durvillaea is restricted to the Southern Hemisphere. There are three species. Durvillaea antarctica, found on the Antarctic continent and associated islands, as well as the south island of New Zealand and the tip of South America.

These kelps grow to a length of 12 metres or more and are specialists in surviving the roughest and harshest of ocean environments.

A report on the Hormosira pheromone research has been prepared for publication in the journal “Experientia.” The Monash research is supported by grants from the ARGC and Department of Marine Sciences and Technology.
Ancient music found in law book binding

IN 1935 and in 1938, on the eve of World War 2, fragments of a Medieval manuscript were found in the binding of two 16th Century law books in Italy. One of the books was in the State Archives at Lucca, the other in the Communal Library in Perugia.

The parchment fragments, which became known as the Mancini Codex, were discovered by Italian scholars, Professor Augusto Mancini and Alfredo Bonaccorsi.

It was not until after the War that it was realised that the fragments were part of the one manuscript — a collection of 14th Century secular songs, composed by a range of composers including Bartolino da Padova, one of the most important musicians of the time.

The badly-damaged manuscript contains 76 musical pieces, including a beautiful canon and more than 60 two- and three-part Italian and French love songs.

The complete manuscript must have contained twice that number, according to Monash musicologist Carol Williams, who has just completed a transcription of the manuscript.

Her three-volume study, which has taken eight years to complete, includes a transcription of the music and text and an analytical study of the composers and music of the time.

Notation difficulties

To transcribe the manuscript, she had to become proficient in Middle French, Middle Italian and Middle Latin, and had to grapple with the problems of missing music and text, the versification rules of the three languages and the complexities of 14th Century musical notation, which is quite unlike the musical notation used today.

"The notation used in the 14th Century is tremendously difficult," she says. "You have to understand the context before you can transcribe the music. The notes have no absolute value themselves.

"In modern notation a minim is a minim wherever you have it. It is always going to be worth two crotchets, and a crotchet is always going to be worth two quavers, no matter where you put them.

"This was not so in the 14th Century. The absolute system only came into use in the 16th Century. Before that it was all contextual notation.

"In the 14th Century, a minim might be worth two, three or more notes of the next lowest value.

"In transcribing you have to understand the context and use your imagination. It becomes even more difficult when part of the text and notation is missing."

Williams says the music in the manuscript is in the tradition of the Italian 14th Century madrigal, with very sophisticated verse, in the style of Petrarch, one of the most important literary influences of the day.

The music is not as sophisticated and rhythmically complex as the French music of the 14th Century, but, like Italian Opera, Italian 14th Century music is beautiful, melodic, with long flowing lines.

There are ballate, French rondeaux, French virelais, and a canon, "a lovely piece which took years to transcribe", in the collection.

The ballata and virelai were originally dance songs, she says, but by the 14th Century they were probably no longer danced to, and had become stylised.

Most of the songs are about disappointed love, but 11 or 12 in the collection are what musicologists call "heraldic" songs. The lyrics of the songs speak of the heraldic symbols of the "families of power" about whom they were written, and in this case appear to refer to one of the Visconti of Milan.

"The texts of these songs don't make much sense, unless you understand the heraldic symbols," Williams says. "And they are a headache for translators because the heraldic symbols of the period are poorly documented."

Williams says the Mancini Codex manuscript is not as magnificent as the famous 14th Century manuscript, the Squarcialupi, which is housed in the Fiorentine Library.

The Squarcialupi manuscript contains miniature illuminations, beautiful lettering and has what are presumed to be portraits of the artists on the title page of the first work of each.

The Mancini Codex is a more work-a-day manuscript, designed for performance. It has graffiti in the margins and was obviously not highly regarded as a manuscript. Later it was used to support the spine and backs of the law books found in the Italian libraries, and

7

Continued overleaf

MAY, 1983
Music find

fragments may have been used in other books.

Williams, who performs with the Early Music group, Acord (a Monash-associated group), and plays the minstrel harp, the Gothic harp and the rebec (a three-stringed violin), has already performed some of the music from the Mancini Codex.

Last month, at the Early Music Festival, "EMU '83", held at Monash and organised by the Early Music Society, Williams' group performed "Music for Dante" which predates the music in the Mancini Codex.

The Mancini Codex music is polyphonic music, so-called because it combines several simultaneous voice parts.

The Dante music looks back to the troubadours.

MONASH REVIEW