PROTOTHERIA

The Sub-class Prototheria of class Mammalia include 3 genera ornithorhynchus, Echidna and Platypus - of egg laying mammals commonly called Monotremata. They represent a very primitive level of mammalian evolution and constitute a connecting link between mammals and their reptilian ancestors. They are therefore mammalian in some respect, but in other respect as fully reptilian.

Distribution: found in Australia and neighbouring islands of Tasmania and Guinea. Due to the sub-basin all around, they have been forced to a restricted distribution without further evolution.

Habit and Habitat - Nocturnal burrowing, aquatic/terrestrial oviparous mammals; Insectivorous.

External features

1. Body is covered with hairs; hairs on back are coarse or spine like
2. Ear is without pinna
3. Poison spur is present in male
4. Tail may be present or absent
5. Digit ends in sharp claws and are webbed
6. Mammary glands are without teat
7. Jaws are either beak-like or produced into a rostrum.

Body cavity - A muscular diaphragm is present between the thoracic cavity and abdominal cavity.

Skeleton

1. skull dicondylic and the sutures between the bones are not distinct.
2. Skull cavity large, cranial walls thin and smooth.
3. The tympanic bulla is absent and the malleus and incus are comparatively larger.
4. Mandible is slender with slightly marked coronoid process and made of dentary only
5. Scapular spine is placed at the anterior border.
6. Vertebrae are without epiphysis.
7. Ribs are with capitulum only.
8. Coracoid and epicoracoid bones are well developed
9. A-T shaped interclavicle is present.
10. Acetabulum is perforated
11. Ischio-pubic symphyses is present
12. An epipubic bone is present.

Digestive System

i) Tongue long and sticky
ii) Sticky Saliva for capturing insect
iii) alimentary canal ends in a cloaca.

Circulatory System

i) Heart four chambered
ii) Right auriculo-ventricular valve is incomplete & fleshy
iii) Chordae tendinae absent
iv) Only left aortic arch present
v) RBCs are non nucleated
vi) An anterior abdominal vein is present in Echidna.
vii) Imperfectly warm blooded.

Respiratory System - Respiration is pulmonary (= lungs)

Nervous System

(i) Brain simple (poorly developed)
(ii) Corpus Callosum absent
(iii) A large anterior commissure present
(iv) Cochlea is less coiled and possess a lagena.
(v) Cerebrum smooth in Ornithorhynchus, but convoluted in Echidna

Urinogenital System

i) Kidneys - metanephric
ii) ~~Cochlea less coiled and possess a lag~~
Uterus open into urinogenital sinus.
iii) Testes are abdominal
iv) In male an erectile penis (made of corpus spongiosum and corpus fibrosum) is present.
v) The penis bears a groove for conveying spermatozoa
vi) Right ovary is reduced
vii) The Oviducts open into the Urinogenital sinus in front of the Ureter.
viii) Uterus and Vagina are absent
(ix) Females are oviparous.

Development - (i) Fertilization internal

(ii) Eggs have much yolk
(iii) Egg shell is tough
(iv) Cleavage - meroblastic
(v) Modified sweat glands produce Milk on which young ones are fed.

Affinities of Prototheria

Prototherias are primitive mammals and posses a unique mixture of reptilian and mammalian characters. They represent an intermediate stage between two class of Vertebrates, and provide the living bases for. Therefore, their affinity can be considered under the following two heads

(1) Reptilian ~~ancestor~~ affinities

The Prototherians possess a number of characters that are shared by reptiles and are as follows.

a) External pinna absent
b) Tympanic bone does not form a bulla.
c) Suture between skull bone obliterated
d) epiphyses absent
e) Ribs single headed
f) T-shaped interclavicle present
g) Separate pterygoid
h) Clavicles, coracoids and precoracoids well developed
i) Ischia and Pubs form a ventral symphysis
j) Acetabulum perforated
k) Presence of cloaca
l) The right auriculo-ventricular valve incomplete and fleshy
m) cloaca present
n) Corpus Callosum absent
o) Testis abdominal
p) Distinct vagina and uterus absent
q) Female oviparous.
r) Eggs yolky
s) Cleavage meroblastic
t) Imperfectly homoiothermous
u) Development of foetal membrane of reptilian type.

(2) Affinities with Marsupials

The Prototherians share the following characters with marsupials :—

a) Similar skull structure
b) Marsupial bone present in both
c) General contour of brain similar
d) Mandibular inflection similar
e) Foetus of monotremes resembles that of Marsupials
f) Lactation is similar.

On the basis of these similarities, Gregory (1947) included both the groups in a Sub class - Marsupionata. However, it is clear that prototherias originated from the main line of mammalian evolution and not from a pre-marsupial stock.

Though monotremes share a no. of reptilian characters, they possess many distinctly mammalian characters such as,

1) Presence of hair on body
2) Presence of diaphragm
3) Presence of Mammary glands
4) Dicondylic skull
5) Mandible is formed of dentary alone.
6) Presence of three ear ossicles
7) Cervical Vertebra seven.
8) Like body typically mammalian
9) Presence of a moderate intestinal caecum
10) Heart four chambered with persistent left aortic arch only.
11) RBCs are non nucleated
12) Brain with four optic lobes.
13) Cerebellum well developed
14) Cochlea slightly coiled
15) Fertilization internal.

Conclusion: The mammalian features clearly indicate that monotremes are mammals and should be treated as a separate subclass due to the presence of reptilian characters in them. It also indicates that monotremes evolved independently from the early mammal like reptiles, but failed to complete the evolutionary transformation of higher Mammals.

So it is clear that they represent the end product of a Sleeper evolutionary line of mammal like forms (= reptilian stock) and not from the main stock of mammalian evolution. Hence they can not be regarded as ancestral to higher mammals though they are connecting link between reptiles & mammals.